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INVESTIGATION OF TAYLOR SYSTEM OF SHOP MANAGEMENT

HEARINGS

BEFORE THE

COMMITTEE ON LABOR OF THE HOUSE OF REPRESENTATIVES

SIXTY-SECOND CONGRESS, FIRST SESSION

ON

HOUSE RESOLUTION 90

COMMITTEE ON LABOR

W. B. WILSON (Chairman), of Pennsylvania.

W. L. HENSLEY, of Missouri	FINLY H. GRAY, of Indiana.
JAMES P. MAHER, of New York	JOHN J. GARDNER, of New Jersey
ARTHUR B. ROUSE, of Kentucky	E. B. VREELAND, of New York
DAVID J. LEWIS, of Maryland	E. H. MADISON, of Kansas
WILLIAM S. HOWARD, of Georgia	W. C. HAWLEY, of Oregon
FRANK BUCHANAN, of Illinois	J. M. C. SMITH, of Michigan

AGNES H. WILSON, *Clerk*

WASHINGTON
1911

[House resolution 90, Sixty-second Congress, first session.]

Whereas it has been disclosed that the United States Government has partially installed in certain Government work a system of shop management known as the "Taylor system"; and

Whereas it is now proposed and determined that the said Taylor system, or parts thereof, shall be extended to and installed in other branches of Government work; and

Whereas the said Taylor system appears to be of such a character and nature as to be detrimental to the best interests of American workingmen, being in its essential parts a "high-speed" process, where none but the strong survive and they being crowded constantly to the maximum point of physical exertion, to the end that an increased output may be obtained and at a low labor cost; and

Whereas it has ever been recognizd that one of the highest functions of any Government is to guard with zealous care the happiness and welfare of its great army of producers; and

Whereas the partial or complete installation of the said Taylor system in Government work is a matter of tremendous importance to the people of the United States, and may be followed by consequences of a far-reaching character both to capital and labor: Therefore be it

Resolved, That the Committee on Labor be, and they are hereby, authorized and directed to investigate thoroughly and completely the so-called "Taylor system" of shop management with especial reference to—

First. Its effect on employees.

Second. Its applicability to Government works.

Third. Its effect on wages and labor cost.

Fourth. Its possible reduction of the expense of manufacture.

Fifth. To what extent, if any, it is being adopted in Government work, and its effect.

Said committee to make a full report to this House as to whether, by reason of any facts thus ascertained, there should be legislation by Congress with reference thereto.

Said committee as a whole, or by subcommittee, is authorized to sit during the recess of Congress, to send for persons and papers, and to administer oaths; and

Said committee is hereby authorized to employ such stenographic or clerical assistance as may be necessary for the purpose of carrying out the provisions and purposes of this resolution and to pay the expense thereof from the contingent fund of this House upon warrants signed by the chairman of said committee.

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1912

INVESTIGATION OF TAYLOR SYSTEM OF SHOP MANAGEMENT.

COMMITTEE ON LABOR,
HOUSE OF REPRESENTATIVES,
Washington, D. C., Friday, April 28, 1911.

The committee met at 10 o'clock a. m., Hon. William B. Wilson (chairman) presiding.

The CHAIRMAN. Several gentlemen have asked for an opportunity to be heard on House resolution No. 90, and the committee has been called together for that purpose this morning. I suggest that Mr. Pepper, who is the author of the resolution, be heard first.

STATEMENT OF HON. I. S. PEPPER.

Mr. PEPPER. Mr. Chairman and gentlemen of the committee, it is evident from a reading of the resolution that any hearing that may be had at this time should not go into the merits of the question of the Taylor system, but only so far as to ascertain in a general way what that system comprehends. I might say, however, that the question is so important, and it is so recognized by both the laboring men of this country and the employers of this country, that general notice has been taken of it in the magazines and in the public press. It involves such a change in shop management, in the attitude of capital toward labor, and the treatment of labor by capital, that, whatever its merits or demerits may be, it is recognized as a distinct policy, which, if carried to its ultimate conclusion and ultimate end, will result in a decided difference in the condition of the laboring people of this country. Now, it has grown to be such an important question, and it has received such recognition, that the United States Government has started to inaugurate the system in the various Government works of the country, especially in the arsenals of the United States. I will try to confine myself to the resolution, because there are a number of laboring men here, men from the arsenals of the United States, and other representatives of labor, who can give you answers to any questions with reference to the system itself a great deal better than I can, but I want to call your attention to the fact that it is such a question that this committee, being a Committee on Labor, and being the committee to deal with matters which affect labor conditions in this country to-day, ought to give it their careful consideration.

I suggest at the beginning that the question may arise in your minds why a resolution should have been introduced calling for an investigation when, of course, an investigation could be had by your

committee without any resolution being passed by Congress, and that is the point to which I wish to address myself at this time. You will notice in this resolution that I have called attention to the system and then have specified certain details and points which it might be well to investigate. Then I ask that Congress have this committee, either by a subcommittee or by the whole committee, to investigate this question, to sit during recesses of Congress, and to have authority to summon witnesses, books, and papers, to administer oaths, and to pay the necessary expenses for clerical hire from the contingent fund of the House. Now, I think that is a vital point in this investigation. You can not, in my judgment, investigate a subject of so much importance, covering such a wide range of conditions, located in various parts of the country, without complete authority. Now, this system, known as the Taylor system, has been instituted by the War Department in the Watertown Arsenal; it is now proposed to institute it in the Rock Island Arsenal; and, to some extent, it has been instituted in the Brooklyn Navy Yard. This system was formulated by a man named Taylor, a man who has been employed, and who has charge of the employment of labor, in the steel mills of Pennsylvania, in the Midvale Steel Works, and in a number of manufacturing establishments. He has written a book or pamphlet, which I hold in my hand, covering several hundred pages, which undertakes to lay down his theory. He has also written a number of magazine articles. There is a committee here to-day from the Rock Island Arsenal, which has appeared before the Secretary of War to protest against the inauguration of this system in the arsenals of the United States, and which comes before you gentlemen this morning, who probably have not had this matter called to your attention. I simply want to state the objections they have urged, without going into a discussion of the merits or demerits of the system, but mereby to show that the matter is one which this committee ought to investigate thoroughly. Here are some of the points:

(1) The replacing of the skilled mechanic by the laborer and the consequent lowering of the wages to little better than laborer's wages.

(2) The relentless speeding up of workmen to the extent that only a small percentage of workmen are able to stand the pace.

(3) The use of the stop watch in ascertaining "unit-times."

(4) The system of promotion, which seems to be based on the contest principle; that the man who has the least regard for his fellows if he also has ability wins.

(5) The bonus and differential rate systems for fixing compensation and the piecework system with Mr. Taylor's methods for ascertaining what shall constitute a day's work.

(6) The system of discipline advocated, which starts with punishing the most flagrant of offenses, principally those against other workmen, and which increases the number of acts to be regarded as offenses until the required submission on the part of the workman is secured and the "factor of safety" in human endurance is reached.

(7) The principle that workmen must be dealt with individually and not in masses or through committees, that it is no concern of one workman what happens to another.

Now these are some of the objections. Whether or not these objections are good, as applied to the Taylor system, is a question which I think should be investigated. I am not here, as I stated, to argue either on the merits or the demerits of the Taylor system; I only want to call attention to the fact that it proposes such radical changes

in the conduct of the working establishment of this country, and that as it is being applied to Government work and will affect the employees of the National Government, and that it is of such importance that in the interests of labor it should be investigated. Now, it may be that some of these objections are not good; it may be that the objections raised by labor at this time are not well founded, but that is not an argument against the investigation of the subject. If the objections are not good, the investigation will so show, but if they are good, then it is of the more importance that some legislation should be enacted which will have a tendency to prevent, at least, the National Government setting the example and putting its stamp of approval on a system open to such objections. The Government should not approve a system which reduces the laboring man to a mere machine, to an organism which is to be put to its greatest physical test, not for the benefit of the laboring man, but only for the purpose of wringing from that laboring man the highest possible result, regardless of his health or happiness. Now, I think that would be an unwise policy for both the employer and the employee.

There are a number of gentlement here who can answer a great many questions, which no doubt will arise in the minds of the committee, in reference to this matter. This question has received the marked attention of labor all over this country, and I do not believe that any investigation that you gentlemen could conduct without the authority contained in this resolution would be effective. I do not believe that you could sit here and listen to arguments purely from the theoretical standpoint and arrive at any just conclusion. You must ascertain the facts; find out where this system has been in operation; what was its effect upon labor and the condition or working people, and determine the line of your investigation from those facts. I might say that this system was in vogue at Bethlehem, Pa., for some time, but was afterwards abandoned. Now, that would be a very important question to investigate; find out why it was abandoned and how it operated there. We have two stories about the matter, one from the standpoint of the employer and one from the standpoint of the laborer, and it will be a very important question to determine why a system that has received such recognition from the United States Government should have been abandoned by a private institution.

Mr. VREELAND. How long has this system been in use?

Mr. PEPPER. I can not tell the exact number of years, but I think it has been in use for five or six years. You understand this system is so complex that it can not be inaugurated in a day or a month or a year; it takes two or three years to get it into operation. As Mr. Taylor says, if this system should be inaugurated at once there would not be any men working in the shops. You must gradually work it in in order to allay what he calls the suspicions of the laboring men.

Mr. BUCHANAN. Did I understand you to say that Mr. Taylor advocated treating with laborers as individuals and against treating with them collectively?

Mr. PEPPER. That is a part of the theory which he advocated.

Mr. LEWIS. Does it necessarily follow that there should be no collective relations among the workingmen?

Mr. PEPPER. It does, if the system is carried to its ultimate conclusion. Under this system every man is put to the highest degree of efficiency. In this book here he attempts to get up what he calls a unit of time system; that is, the shortest space of time in which the best man can produce a given amount of work, and the work of such a man in that given time constitutes the standard. Now, if a man does not reach that standard of efficiency——

Mr. LEWIS. Are the men docked for the shortage?

Mr. PEPPER. Under this Taylor system he has to be put at something that he can do better, but if you follow that to its logical conclusion there will always be the average man, a man who is not the best specimen of physical manhood, who can not find work that will return him the living to which he is entitled by reason of the very fundamental principles governing the employment of labor.

Mr. BUCHANAN. If that system were put into effect, would not every man work at the highest rate of speed he could go, and would not every workingman undergo a strain in the effort to reach that standard?

Mr. PEPPER. Yes; that would be the standard. I might add that Mr. Taylor says that that standard is only that degree of speed and that degree of wage which the laboring man will be happy and thrive under.

Mr. HENSLEY. Who is to be the judge of that?

Mr. PEPPER. The employer, and, therefore, the ultimate result will be that in order to procure bread for his family a man will say that he is happy whether he is or not; otherwise, it would be plain that he has not attained to the standard prescribed in the system under which he works. Now, the question as to whether or not he is happy or is thriving is left to the decision of a partial judge, that is, it is left to the decision of the man who is trying to wring as much profit as possible out of a man's muscles. I may not understand this system, and that is the reason I am asking this committee to investigate it.

It may be that I have not read the book right; it may be that the facts I have ascertained from workers under the system may be wrong and misleading; but I submit to you gentlemen that this matter is of such importance and is being opposed by so many laboring men who look to the welfare of themselves and their families that you will be doing a service to this country if you investigate it thoroughly. You will be doing a service to the manufacturers of this country if you can prevent the inauguration of a system which, in its ultimate results, will bring labor to a lower standard than at the present time, because unwise men sometimes in their greed for gain will do things to wring profit from labor which, if they were wise to their own interests, they would not do. So I think we should look at it from the broad standpoint—not even from the standpoint of the laboring man, but from the standpoint of the general welfare of this country. If this system is carried out to its ultimate conclusion, it will certainly result in a complete change of the attitude of capital toward labor, and it is, therefore, a matter that ought to receive the attention of Congress and its merits thrashed out. I do not want to take up the time of the committee by discussing the merits and demerits of this system, because there are gentlemen here who are thoroughly familiar with it.

Mr. VREELAND. How generally is this system employed?

Mr. PEPPER. So far as the Government is concerned, it has been in effect at the Watertown Arsenal about two years, but, as I have already stated, it takes some time to completely inaugurate the system. It is being tried at the Brooklyn Navy Yard, and it is proposed to install it at the Rock Island Arsenal. Now, a number of private institutions—a number of them in Philadelphia, although I can not now call the names—are now using the system. The Midvale Steel Works and a great number of manufacturers have started it. Some of them have the system only partially, and some of them have it complete.

Mr. LEWIS. Has any connection been shown between this system and an undue tendency to accidents?

Mr. PEPPER. I can not answer that; I do not know. We have here what he calls the factor of safety, that is, he punishes workingmen by a reduction in their wages for the purpose of securing that factor of safety, but this is effective in many cases to simply reduce the wages of the laboring man.

Mr. LEWIS. The wages of the men employed in these arsenals are fixed by regulations of the War Department and not by statute, are they not?

Mr. PEPPER. Yes, sir; there are some regulations, I think, that govern for periods of time. Of course, the War Department has complete charge of that part of it. In fact, they say that the attitude of the arsenals toward wages has been that they will pay as much for eight hours' work in the arsenal as private individuals in the vicinity of the arsenals pay for ten hours' work. That is the general attitude.

Mr. HENSLEY. What conclusions have they reached about it since that system has been in vogue at the Watertown Arsenal?

Mr. PEPPER. Gen. Crozier says that there has been a great saving to the Government, but he has not yet done anything more. I should have stated that the Taylor system comprehends a great deal more than the speeding up of the workmen. That is only one of the things. I think a great deal of the system is not original with Mr. Taylor. I think he compiled a great many things together and advocated them as a general system. One feature of the system is the double check from the storehouse to the factory, so that a man can be supplied with the proper material, and not lose time running around to find material for the work upon which he is engaged. There is also a general system of supervision, which is a very vital part of the system. A planning department is provided where every piece of work is planned out, with written instructions as to what each man has to do. Now, in Watertown, they have done nothing except to put in the general scheme of saving time in the making of tools and things of that kind. Nothing has been done there towards the inauguration of the speeding-up process and trying to eliminate those who have not been able to reach a certain standard. But, of course, Gen. Crozier says that if it works any hardship to the laboring man he will stop short of that; but he is to be the judge.

Mr. Taylor himself says that the system must be carried out in full, or he will not stand responsible for its effectiveness, and the natural result is that if a man can not attain this high speed—that is, if he can not perform this greatest amount of work in a given space of time—he will find himself without a job. In my opinion, he will be eliminated. One of the illustrations he uses is in the case of carrying

pig iron and loading it on cars. The men who had been handling the pig iron had been loading 16 tons per day on the car. By various experiments and by picking out the big, husky fellows—that is, the men who looked as though they could do a great deal of work—and by encouraging them, it was found that it was possible for some of these men to carry 48 tons in a day. That became the standard; it was what the best man he could find could carry in a day, working under a constant pressure all the time, and, while the other men were getting $1.15 per day, he at once paid the man who could carry 48 tons per day $1.85. He did not explain how that man felt when he went home to his family and what was the effect on the man himself for putting forth that extra exertion.

The CHAIRMAN. Referring to this proposition of finding a man something else to do when he is not able to reach the standard fixed in the work that he is doing, has Mr. Taylor worked out any system by which these men will be able to find work? Has he devised any system by which the men who are removed from the different branches of employment because of the fact that they do not reach the highest standard can be employed?

Mr. PEPPER. He has made one general proposition; that is, that a man who can not reach this highest standard in one line of work will find some other kind for which he is better suited. But suppose every industry in this country should adopt this system? You can see what it will result in. Here is only one part of it saying in a general way that these men will be provided for in other places.

Mr. VREELAND. What would it result in, in your opinion?

Mr. PEPPER. In my judgment, it would result in a great many men being thrown out of employment altogether. I think it would result in a great army of unemployed men.

Mr. VREELAND. That would be impossible if the work is required to be done? They can not all be of one standard. There would still be a demand for labor.

Mr. PEPPER. That might be.

Mr LEWIS. What would be the effect of throwing out of employment 100 machinists, say men who are 40 years of age and who are accustomed to a certain line of work and working environment? They would not be able to labor effectively if thrown out of their accustomed employment.

Mr. PEPPER. As a general rule, there are wants always to be supplied and labor to supply these wants, but my argument is this: Suppose this system is carried to its ultimate conclusion, and men are put to the greatest physical test that the human organism can stand. In other words, in my judgment, this system has no regard for the physical welfare of the man. I have this idea about the laboring man: I believe that a laborer can work at a certain standard to be ascertained day by day, taking into account his rest at night and his other bodily wants. He can go on indefinitely and can work at a still greater rate of speed and accomplish more by calling upon his reserve force. By doing so he may attain greater efficiency, but that reserve force, having been called into play for a few years, is worn out, and the man is left a charge upon the community. Now, this Taylor system is calling upon the reserve force of the man in order to turn out the greatest amount of work in the least space of time.

The CHAIRMAN. If an employer has to replace a machine because it is worn out, that would naturally cost him money, but if he has to replace a human machine that has been exausted by this method, it would not cost him anything.

Mr. PEPPER. No, sir; labor is on the free list.

Mr. VREELAND. To what extent have you investigated this matter?

Mr. PEPPER. My investigation has been entirely by correspondence, with the exception of the discussion I have had with these gentlemen from the Rock Island Arsenal, who have gone into this subject rather extensively. I have read Mr. Taylor's book and some magazine articles about it.

Mr. SMITH. Do laboring men complain about this system?

Mr. PEPPER. I have here correspondence with men at the Watertown Arsenal, and I have had correspondence with men at the Rock Island Arsenal, and various letters from others where the system is in vogue, and they are complaining. Now, these men are interested, because they constitute a great army of men employed out there. These gentlemen here represent 1,500 or 2,000 men. They have been told that this system will be inaugurated at that arsenal, and they are here this morning, and have been before the War Department. The War Department has authorized and directed that the system be installed out there, and these gentlemen are here to protest against it.

Mr. GARDNER. As I understand it, this system consists of two parts; the first part of the system provides for a saving of time in the performance of the work by having one man to do the planning, which would take a part of the time of a great number of men if each man did it for himself. The other part, which you fear, is that which in seeking for efficiency, will drive men to strenuous efforts. Now, as to the other part, which goes only to the matter of reorganization, is there any objection to that?

Mr. PEPPER. I do not think that any one could object to that. I do not think that Mr. Taylor has any particular patent on that proposition, but under this general scheme that he has outlined——

Mr. GARDNER. One moment please, I am talking specifically about the Taylor scheme, if I understand you, that is, that part of the scheme outlined by Mr. Taylor, and which has been in operation in the Watertown Arsenal, and which Gen. Crozier says has resulted in great economy. If I understand it, up to this time, the other part of the scheme has not been put into operation.

Mr. PEPPER. But simply for the lack of time. At least Gen. Crozier says not.

Mr. GARDNER. If Gen. Crozier is right then in his two assertions, this is established that the adoption of so much of the scheme as appertains entirely to the matter of organization and the management of details and time, results in great economy, without applying the other and dangerous part of it that drives men too rapidly.

Mr. PEPPER. He makes that claim.

Mr. LEWIS. I will ask you whether or not there are any methods of comparison by which to judge the relative efficiency of the men employed in these Government arsenals with the men employed in similar private undertakings?

Mr. PEPPER. I do not know of anything of that kind. They get their men from all over the country, men who have been engaged in private employment.

Mr. LEWIS. There has been no comparison made of the product per man?

Mr. PEPPER. I think not; I do not know of any.

Mr. VREELAND. Let us hear from some of the men who can tell us about the practical operation of the system. I do not know much about it.

The CHAIRMAN. I suggest that we hear from some of the gentlemen from the Rock Island Arsenal who are present and desire to be heard. I may state for the information of the committee that there are three gentlemen here, Mr. Alifas, Mr. Dyas, and Mr. Bragdon, who are employees of the arsenal. These gentlemen are here at the present time on leave of absence. Knowing of that fact, and it having been intimated that if they appeared before this committee without being requested to do so it might endanger their employment, I have requested them to appear before the committee and make such statements as they desire.

STATEMENT OF MR. N. P. ALIFAS, OF THE ROCK ISLAND ARSENAL.

Mr. ALIFAS. Mr. Chairman and gentlemen of the committee, in speaking upon this subject I take it that the matters which are to be brought to the attention of the committee should be such as would lead them to form an opinion as to whether or not this Taylor system should be investigated, so I will not go into as much detail as I might otherwise do.

It seems to me that one of the best ways to show just what Mr. Taylor's methods are is to quote from his book, and I can see no other or better way of convicting him in regard to his system than to quote his own work.

Mr. VREELAND. Would it not be well for you to tell us about the practical operation of the system? I would like to hear something about the practical working of the system, if you are familiar with it. Are you working at an arsenal?

Mr. ALIFAS. I am not working at an arsenal where they are employing that system. They are just starting it at the Rock Island Arsenal.

Mr. VREELAND. Are you a mechanic?

Mr. ALIFAS. Yes, sir; I am a machinist.

Mr. VREELAND. Where do you work?

Mr. ALIFAS. I work at the Rock Island Arsenal.

Mr. BUCHANAN. I suggest that the gentleman be permitted to go on in his own way.

Mr. ALIFAS. I wish to state that my only purpose in reading these few paragraphs from the book is to bring before the committee the specific provisions of the system. Of course, if you decide to investigate the system, you will read the book, but you will not wait to read the book through before you decide whether or not you will investigate it. That is the only reason I have for wishing to read these paragraphs.

Now, in the first place, the two principal things that we object to in the Taylor system are the lowering of wages and the speeding of

men unduly. Mr. Taylor insists that his system will raise wages, but that is only apparent, for the reason that in raising wages he raises the common laborer, while the common laborer does the work that was formerly done by skilled mechanics at much higher wages.

Now I will read paragraph 319 of this book, which relates to that subject:

It is true, for instance, that the planning room and functional foremanship render it possible for an intelligent laborer or helper in time to do much of the work now done by a machinist. Is not this a good thing for the laborer and helper?

Section 247 reads as follows:

The full possibilities of functional foremanship, however, will not have been realized until almost all of the machines in the shop are run by men who are of smaller caliber and attainment, and who are therefore cheaper than those required under the old system.

It would seem here that the effect of his system would be to have you work only those of lower caliber and attainments, and that would lower the standard of intelligence, if nothing else, if his process of selection is to be carried out.

Paragraph 249 reads as follows:

Of course, they were paid more than laborer's wages, though not as much as skilled machinists.

That is the case where men doing machinists' work are laborers. Now, Mr. Taylor advises that in starting the shop.

I will now read from paragraph 309.

Mr. BUCHANAN. On what page?

Mr. ALIFAS. Page 1418. In managing a shop, according to Mr. Taylor, he decided that the best way to do it was to select workmen of inferior caliber and train them up to do the work, while on the part of foremen he selects men who are a little too good for the shop to initiate the system. After the system has been started he can supplant the foremen by men of inferior caliber, who are cheaper.

I will read from paragraph 309:

If the work is of a routine nature, in which the same operation is allotted to be done over and over again with no great variety, and in which there is no apparent prospect of a radical change being made perhaps through a term of years, even though the work itself may be complicated in its nature, a man should be selected whose abilities are barely equal to the task. Time and training will fit him for his work, and since he will be better paid than in the past and will realize that he has been given the chance to make his abilities yield him the largest return, all of the elements for promoting contentment will be present.

That is how he proves that men under his system are satisfied and content.

Then, in paragraph 308, he says:

In selecting men to be tried as foremen, or, in fact, for any position throughout the place, from the day laborer up, one of two different types of men should be chosen, according to the nature of the work to be done. For one class of work men should be selected who are too good for the job, and for the other class of work, men who are barely good enough.

Now, that shows that he proposes to use laborers, although he pretends to advance wages. Then, as to the high-speed part of it, I will read from paragraph 149:

Each man in the establishment, high or low, should daily have a clearly defined task laid out before him. This task should not in the least degree

be vague or indefinite, but should be circumscribed carefully and completely and should not be easy to accomplish.

Paragraph 153 reads as follows:

When an establishment has reached an advanced stage of organization, in many cases a fifth element should be added, namely, the task should be made so difficult that it can only be accomplished by a first-class man.

Paragraph 384 reads as follows:

The writer has, in almost all cases, solved this part of the problem by fixing a task which required a first-class man to do his best, and then offering a good round premium. When this high standard is set it takes longer to raise the men up to it. But it is surprising, after all, how rapidly they develop.

Of course, that is due to the pressure which he brings to bear upon them under his methods of discipline.

Paragraph 101 shows how he arrives at what should constitute a day's work. That paragraph reads as follows:

His first step was to place an intelligent, college-educated man in charge of progress in this line. This man had not before handled this class of labor, although he understood managing workmen. He was not familiar with the methods pursued by the writer, but was soon taught the art of determining how much work a first-class man could do in a day. This was done by timing with a stop watch a first-class man while he was working fast.

Mr. VREELAND. Has all of this been installed in the Watertown Arsenal?

Mr. ALIFAS. No, sir. It has been installed there at present only as far as this gentleman has spoken of, in devising a business method of routing the work in the shop and in reference to instructions as to how the work should be done, subdividing it up and the like of that.

Mr. SMITH. Who is Mr. Taylor, and where does he live?

Mr. ALIFAS. His present address is Chestnut Hill, Philadelphia.

Mr. SMITH. In what business is he engaged?

Mr. ALIFAS. He is engaged in the business of installing this system; he has a corps of experts aiding him in that work.

Mr. SMITH. Is he a manufacturer or an employer?

Mr. ALIFAS. I do not think so. He was the master mechanic for the Midvale Steel Co. about 20 years ago, and while a master mechanic there he experimented with this system, which he calls by his own name.

The provision as to gradual speeding up is found in paragraph 295, which I will read:

In reaching the final high rate of speed which shall be steadily maintained, the broad fact should be realized that the men must pass through several phases, rising from one plane of efficiency to another, until the final level is reached.

Sometimes in trying to get men to work at this terrific pace he has difficulty in finding labor, and in respect to that he has this to say in paragraph 385.

Thee is a great difference in the labor of some of the adjoining States in this country, and in one instance in which the writer was aiming at a high standard in organizing a works he found it necessary to import almost all of his men from a neighboring State before meeting with success.

Likewise, in paragraph 166, he says:

Where the labor market is large enough to secure in a reasonable time enough strictly first-class men, the piecework rates should be fixed on such a

basis that only a first-class man working at his best can earn the average amount called for.

Mr. PEPPER. Is it not true that the whole system is based on a great supply of labor and the selection from those of the best specimens?

Mr. ALIFAS. Yes, sir.

Mr. GARDNER. Is not that the same reorganization system that is being put in operation by business houses, particularly in the business of publishers, the publishers of magazines, and so on?

Mr. ALIFAS. I do not know that they make a general practice of that. I know that portions of his system have been incorporated in certain large offices where girls are employed as stenographers. His system is applicable to all kinds of work, from that of the common laborer to that of the skilled mechanic.

Mr. GARDNER. Is this not the agency that has been reorganizing the news agencies which handle matter which does not require a large amount of labor and where labor is the least element?

Mr. ALIFAS. I have never heard that; I am not advised as to that.

Mr. GARDNER. An organization system has been recently applied to all this business, and it was not to the cost of labor that the investigation was directed, because labor was not an important element in it; that is all.

Mr. BUCHANAN. How is this efficiency counted in time to the working man? Do they get shorter hours for their strenuous efforts in work?

Mr. ALIFAS. I want to say that if this system is carried out to its logical conclusion, if endurance is to be the test, that would do away with the short working day, because Mr. Taylor in his book says, in discussing the purpose of his scheme, that workingmen should remember that each shop exists first, last and all the time for the purpose of paying dividends to its owners. This purpose would bring speed and hours to the limit of endurance.

Mr. BUCHANAN. I want to know about the attendance of the men and the amount of time that a man would get for his strenuous efforts under this system. In some cases it has been found that a man earning a fine rate of pay receives really very little pay for the effort he is called upon to put forth. Is any account taken of lost time?

Mr. ALIFAS. I do not believe there would be any great loss of time, because he would select men well fitted for the work. He says that men who worked under this system in the Bethlehem steel works became steadier men. One argument he makes is that drinking men could not work under this system because they could not stand the pace.

Mr. BUCHANAN. How about the absence of a man from work for any reason under this system?

Mr. ALIFAS. I do not know of any absence on their part that has been referred to in his works. I presume, however, that under his discipline he intends to get men who will be there all the time, and that if a man persist in laying off he will be discharged.

The CHAIRMAN. Is there any system of credit or of merit and demerit under this Taylor system?

Mr. ALIFAS. Yes, sir.

The CHAIRMAN. And does that system of merit give credit for steady work and discredit for loss of time?

Mr. ALIFAS. Yes, sir.

The CHAIRMAN. Is a man, under that system, given demerit marks for loss of time?

Mr. ALIFAS. Yes, sir; for everything that interferes with his scheme. If his scheme required that a man should be there all the time, he would fix his discipline in such a way that they would be required to be there all the time, or they would not stay.

Mr. BUCHANAN. There is another question I wish to ask you in regard to the arsenal you are familiar with. Is there any difference in the attendance of the workingmen there, or a difference that would be noticeable?

Mr. ALIFAS. This system has not been started yet at the Rock Island Arsenal. The only thing they have done there, that we know of, is to have a number of blanks printed for checking the work and keeping tab on the time required to do a job.

Mr. BUCHANAN. From your own personal knowledge, you do not know anything about that?

Mr. ALIFAS. No, sir; I have never seen the system in actual operation.

Mr. GRAY. Does the policy of this system contemplate dispensing with the services of inefficient men or putting the men on lower wages? Does it comprehend that?

Mr. ALIFAS. It comprehends doing away with inefficiency. There is no place in this system for the inefficient man unless he can be efficient at something. For instance, if a man is not efficient as a machinist, and some other work can be found at which he is efficient, then he would be employed.

Mr. LEWIS. Do you mean efficiency as measured by the product of his labor?

Mr. ALIFAS. Yes, sir; but if a man can not attain the maximum speed at something he would be thrown on the labor market.

Mr. GARDNER. Where do you derive that opinion?

Mr. ALIFAS. From the book that I have been reading to you.

Mr. GARDNER. I do not want to be misunderstood and I do not want to impede the progress of the investigation, but I think it ought to be systematic if it is to carry any weight. Now, the gentleman who is being heard was very properly called, because he was supposed to understand the workings of the system, but he now tells us that he has not seen the working of the system and that he is simply drawing deductions from a printed book, which is open to everyone. Now, he appears to be simply making statements or comments on what appears in this book. He has not yet qualified as an expert on this subject, but is simply drawing deductions from a printed work that is open to everybody to read.

The CHAIRMAN. In my judgment, the gentleman should be permitted to proceed in his own way; and as to the question of whether or not he is an expert, each member of the committee can determine that for himself after he has concluded his statement.

Mr. GRAY. What is the effect of this system? Does it dispense with the services of inefficient men or does it reduce the wages of those people who are inefficient? Do they dispense with their services altogether?

Mr. ALIFAS. According to Mr. Taylor's own printed work, his intentions are, it seems to me, to dispense with the inefficient men. I wish to say in regard to the statement of the gentleman here on

my right that I have never claimed to be an expert on this system. I am simply here for the purpose of protesting against the inauguration of this system.

Mr. GARDNER. I only had in mind the integrity of the record as it is being made up here. A man states facts within his own knowledge or states his conclusion from facts that have been stated, and I think that the record should show which they are—whether they are facts or opinions. I intended no criticism at all.

Mr. GRAY. We would have to call a roll of the committee to find out about that.

Mr. BUCHANAN. I am not familiar with the methods practiced by committees of this kind, but it seems to me that where men are selected, as I understand these men have been selected, to represent a large number of people——

Mr. ALIFAS. Fifteen hundred people.

Mr. BUCHANAN (continuing). When, as I say, these men are selected to represent these people and protest against a system that they believe is injurious to them and their kind, so far as I am concerned, I am willing to listen to their views of the matter, and they can express their views in whatever form they see fit. When it comes to the matter of experts, I suppose that when the committee gets ready to investigate this question experts will be taken into consideration, and it will be for the committee to select them.

Mr. GARDNER. I do not want to be misunderstood, but I think the chairman and the gentleman who has just spoken and all the rest of us want this record to be as strong as the circumstances permit it to be. I think, and suggest with modesty, that if the gentleman who asked the last question—as to what was the effect of this system—had asked the gentleman on the stand what his opinion was of the effect of the system as derived from the printed book that the testimony would be a good deal more valuable if it was not in the form of a statement following a previous statement that the witness had no personal knowledge of the matter at all.

Mr. BUCHANAN. I would like to ask the gentleman whether he represents himself or all of the people who work at the Rock Island Arsenal?

Mr. ALIFAS. I am representing the employees of the Rock Island Arsenal, and not myself personally.

Mr. BUCHANAN. How many people do you represent?

Mr. ALIFAS. About 1,500 men.

The CHAIRMAN. I suggest this: That when any gentleman has been recognized, and objections to his line of statements are made, that so far as the chair is concerned, the chair will not take any cognizance of the objections unless it comes in the form of a proposed action on the part of the committee; otherwise, the gentleman who has been recognized will be permitted to proceed in his own way.

Mr. LEWIS. I want to ask whether there is any printed statement available of the Taylor system as it is intended to be applied to the arsenal, with the suggestion that it may be a very modified form of the scheme?

Mr. ALIFAS. I do not know of any particular document that deals with that special subject. I think if such a document were in existence we would have found it out. His general propositions are well

known from this paper which he read before the American Society of Mechanical Engineers.

Mr. BUCHANAN. Do you know what the Government pays, if anything, to the agents of this system to put it into effect?

Mr. ALIFAS. Mr. Taylor is now receiving $50 per day while at the Watertown Arsenal. He is not there all the time. He is there a number of days in each month to lay out the plans, which are followed out after he has gone. This statement was given me by the Chief of Ordnance, Gen. Crozier.

Mr. SMITH. Can this plan or a part of it be adopted beneficially to the Government without adopting the speeding-up part that you complained of? Do you complain of any other part of the system except the speeding-up part?

Mr. ALIFAS. We are not complaining about any part except those that affect the workman. Whether these other things can be applied or not depends on the leverage they might get on us. It might be well illustrated by a man with the drinking habit; he might be able to stop at some time if disposed to do so, but if the habit gets the upper hand of him, he can not stop. We are objecting to the inauguration of the Taylor system because it is so planned out that one thing leads to another.

Mr. SMITH. Are you objecting to the entire system? Do you object to any part of it being adopted? A while ago you spoke about assembling the material required by the workman by means of messengers, or something of that kind, so that he would not have to take his time and go to the supply room and get whatever he needed to work on. Do you object to that part of the system?

Mr. ALIFAS. That part of the work is not necessarily the Taylor system. Mr. Taylor, in inaugurating his system, may try to make use of all this, but that is not necessarily his system. His system is primarily based on the time-unit idea.

Mr. HENSLEY. I desire to ask one question with reference to the manner of reaching the standard of efficiency. Do you mean that the workman must become expert in some connection or else lose his position?

Mr. ALIFAS. That is what I think the method would imply. There is no middle ground apparently; they must attain to a high standard of efficiency or they can not work there.

Mr. HENSLEY. In other words, if they go lower they must attain to the same high standard of efficiency in the lower position. They must be experts in the positions in which they work.

Mr. ALIFAS. Yes, sir.

I would like to call attention to what Mr. Taylor calls his method of persuasion. I will read from paragraph 293 of this book:

> A certain percentage of them, with the best of attention, will fail in this and find that they have no place in the general organization, while still others—and among them some of the best workers, who are, however, either stupid or stubborn—can never be made to see that the new system is as good as the old; and these, too, must drop out.

You will notice from that that he is the judge as to who shall drop out. The incentive to speed up is the desire of the workman to be among the lucky number who remain.

I will now read from paragraph 166:

> For the success of the system the number of men employed on practically the same class of work should be large enough for the workmen quite often to have

the object lesson of seeing men laid off for failing to earn high wages and others substituted in their places.

He uses the illustration of a common laborer in the employ of the Bethlehem Steel Co., which I will read to you:

Between 12 and 13 tons of pig iron per man had been carried from a pile on the ground up an inclined plane and loaded onto a gondola car by the average pig-iron handler while working by the day. The men in doing this work had worked in gangs of from 5 to 20 men.

The man selected from one of these gangs to make the first start under the writer's system was called upon to load on piecework from 45 to 58 tons per day.

Again, in paragraph 125, he says:

When the writer left the steel works the Bethlehem pieceworkers were the finest body of picked laborers that he has ever seen together. They were practically all first-class men, because in each case the task which they were called upon to perform was such that only a first-class man could do it. The tasks were all purposely made so severe that not more than one out of five laborers (perhaps even a smaller percentage than this) could keep up.

The CHAIRMAN. I believe you stated some time ago that this system had been inaugurated at the Watertown Arsenal in part, but that it had not been inaugurated in its entirety?

Mr. ALIFAS. Yes, sir.

The CHAIRMAN. Do you know of any place, in any department of the Government, where it has been inaugurated in its entirety?

Mr. ALIFAS. No, sir; not anywhere in its entirety.

The CHAIRMAN. Have you any information that would lead you to believe that it is the intention of any department of the Government to inaugurate it in its entirety, including this speeding-up process?

Mr. ALIFAS. Yes, sir; I have a letter sent to our committee yesterday by the Secretary of War, in which he states——

Mr. VREELAND. Is that in writing?

Mr. ALIFAS. Yes, sir.

Mr. VREELAND. Suppose you read the letter. Is that letter in response to a letter from your committee to the Secretary of War?

Mr. ALIFAS. Yes, sir.

Mr. VREELAND. Suppose you read the letter from the Secretary of War and incorporate the other letter in the record.

(The letters referred to are as follows:)

WASHINGTON, D. C., *April 14, 1911.*

Hon. JACOB MCGAVOCK DICKINSON,
Secretary of War, Washington, D. C.

SIR: In compliance with your request of the 13th instant that we submit in writing, for your consideration, the reasons why we object to the installation of the Taylor system of shop management at the Rock Island Arsenal, we offer the following statement:

Some of the features to which we object are as follows:

(1) The replacing of the skilled mechanic by the laborer and the consequent lowering of the wages to a little better than laborer's wages.

(2) The relentless speeding up of workmen to the extent that only a small percentage of workmen are able to stand the pace.

(3) The use of the stop watch in ascertaining "unit times."

(4) The system of promotion which seems to be based on the contest principle; the man who has the least regard for his fellows, if he also has ability, wins.

(5) The bonus and differential rate systems for fixing compensation and the piecework system, with Mr. Taylor's methods for ascertaining what shall constitute a day's work.

(6) The system of discipline advocated, which starts with punishing the most flagrant of offenses, principally those against other workmen, and which increases the number of acts to be regarded as offenses until the required submission on the part of the workmen is secured and the "factor of safety" in human endurance is reached.

(7) The principle that workmen must be dealt with individually, and not in masses or through committees; that it is no concern of one workman what happens to another.

These features of the system seem to be inherent in its entire make-up, as will be seen from paragraph 290 of Mr. Taylor's paper on shop management, which says: "They (the manufacturers) should understand the general philosophy of the system, and should see that as a whole it must be in harmony with its few leading ideas, and that principles and details which are admirable in one type of management have no place whatever in another."

The leading idea which unmistakably pervades Mr. Taylor's entire system is the one stated in paragraph 312, which reads: "All employees should bear in mind that each shop exists first, last, and all the time for the purpose of paying dividends to its owners." This complete elimination of all consideration for the welfare of the employees, subjugated to that of profit for the manufacturer, seems to be the fundamental principle of the system. This seems to be the principle which shaped the leading features of the system, and without any effort on the part of the management the workmen, through the system, would work out their own destruction.

The above considerations were discussed with the Chief of Ordnance on the 10th and 11th instants, with the following results:

The Chief of Ordnance could see nothing objectionable in Mr. Taylor's methods, and intends to try out the various features and continue them, provided they are found to be to the financial advantage of the Government. Humanitarian motives are to have no consideration, but everything must be decided from a business standpoint of view, thus:

(1) If it is found to be practicable to subdivide the skilled trades, such as the machinists, etc., he would employ unskilled laborers to do as much of it as they can and employ tradesmen only when absolutely necessary, thus apparently disregarding Rule II, section 5, and Rule V, section 6, of the civil-service rules.

(2) If it is found to be practicable, and enough men can be secured, he can not see the reason why he should not fix the rate of speed so that only one man out of eight could keep up the pace, i. e., if it becomes necessary to test eight men in order to find one that is able to stand the pace, and that one man is satisfied and thrives under said conditions, it is no concern of his what becomes of the other seven.

(3) If it is found to be successful, and is advised by the efficiency expert who is in charge of the installation of the Taylor system, the stop watch will be used to ascertain "unit times"; the bonus and differential rate systems of fixing compensation, and piecework with Mr. Taylor's methods for ascertaining what shall constitute a day's work, together with such disciplinary measures as will be found necessary to enforce these measures, will be employed.

The following is our criticism of the Taylor system and of the position taken by the Chief of Ordnance:

We believe that the ordinary man is entitled to an opportunity to make a living, and that the Government should not set the example of eliminating him by using the maximum rate of speed to regulate the standard of efficiency.

That the adoption of the system by the Government will place its stamp of approval on Mr. Taylor's methods of treating workmen. Even though it does not push the harsher methods to the limit, the private manufacturer will do so from a consideration of profit.

While we believe in all progressive methods, and that economy is requisite in Government shops, we fail to see the necessity of introducing a system embodying such drastic measures and advocating such undemocratic principles as follows:

(1) The overworking and enslaving of employees.

(2) The elimination of the skilled mechanic.

(3) The tremendous unemployed problem which will be caused by the elimination of workmen who can not attain the maximum of efficiency.

(4) The evil of denying employees a voice in determining the conditions under which they are to work, and the manufacturer assuming the right of doing "his own business" in his "own way," irrespective of the rights of his employees.

This state of affairs has resulted in the horrible labor conditions existing in the steel industries of Pennsylvania, where the maximum of endurance is the test.

(5) The assumption that the amassing of wealth is the question of prime importance, and the effect upon the working people of secondary consideration, instead of regarding the industry of the country as being subservient to the welfare of the entire people, and the fortunes made to be allowed only as an incentive for the maintenance of industry.

(6) The assumption that this system acts as a labor-saving invention which would create a new field for the manufacture of commodities, but is in reality a philosophy which eliminates the average man.

(7) The assumption that it is proper to use a stop-watch for the purpose of ascertaining the maximum amount of work that can be done by an employee without applying the same principle to the manufacturer and ascertain the maximum amount of wages he is able to pay.

(8) The process of securing a body of satisfied workmen by eliminating those who are dissatisfied, thus creating a situation where a workman will refrain from divulging his real feelings in the matter for fear of losing his position.

We believe that in the manufacture of munitions of war that excellence is the main object, and that any system which advocates the excessive speed of two or three times the present output for each employee will not produce the desired results.

Any system whose fundamental basis depends on Mr. Taylor's stop-watch theory for ascertaining the amount of work a workman should do per day, to wit, timing the best man when he is doing his best, and the giving of extra financial inducements while he is being timed to accelerate his speed, which all workmen must attain in order to be employed, is inhuman and unjust, and its adoption can be followed only by discontent and serious labor troubles.

Owing to the fact that the great majority of instances where this system has been started in private establishments it has been found to be impracticable in its entirety, and that nearly every one of the distinctive features of the Taylor system have been discarded in many large establishments, such as the Bethlehem Steel Co. and the American Locomotive Co., after years of unsuccessful experiments, this is evidence that it is not as great a discovery as Mr. Taylor would have the manufacturer believe.

There is no true progress unless all classes progress, and we believe in the sentiment expressed by President Taft, in a recent address, and trust that your department coincides with his view, which is as follows:

"Good business is not everything in life; the making and accumulation of money should not be the chief end of a community. There has been danger in the past that the rush for wealth would injure the moral fiber of our people, and degrade their ideals and standards."

In view of the above-stated considerations, we request that you abandon your present plan of allowing the Taylor system of shop management to be installed at the Rock Island Arsenal.

We also trust that the foregoing statement will explain our attitude in regard to the Taylor system, and request an early reply, informing us of the length of time necessary before a decision in our case will be rendered, in order that we may regulate our stay at Washington accordingly.

Any further explanation pertaining to the contents of this communication will be furnished you upon request.

Respectfully,

N. P. ALIFAS,
B. D. DYAS,
W. H. BRAGDON,
Committee representing employees of the Rock Island Arsenal.

(Address: N. P. Alifas, St. James Hotel, Washington, D. C.)

WAR DEPARTMENT,
Washington, April 27, 1911.

Messrs. N. P. ALIFAS, B. D. DYAS, W. H. BRAGDON,
Committee representing employees of the Rock Island Arsenal,
Rock Island, Ill.

GENTLEMEN: I received, on April 17th, your communication of April 14th, setting forth your reasons why you object to the installation of the Taylor system of shop management at the Rock Island Arsenal, and have carefully considered the same.

The system concerns the general systemization of an industrial establishment, embodying features which, however, do not affect the efforts which the workmen are expected to put forth or their hours of work or compensation, and also features which relate to the output of the individual workman, including instructions for improvement in his methods of work and the stimulation to induce him to do his best and act in general accord with the management.

At the Watertown Arsenal they have not yet gotten beyond the features of the system which concern systemization only, and have attempted nothing affecting the workmen directly, or the terms or conditions of their employment. I learn on inquiry that there has been no determination as yet to introduce any features of the Taylor system directly affecting the workmen at any other establishment than at the Watertown Arsenal, where it is proposed first to give them a trial.

Certainly it seems that there could be no reasonable objection to a practical trial of them at one of the arsenals. That would demonstrate whether or not your objections are well founded. At any rate, there is no present purpose to introduce such features at the Rock Island Arsenal, and therefore your protest in that respect is premature. The board which was convened has recommended only the introduction at other arsenals of some of the features which have already been in use at the Watertown Arsenal, which, as stated, are not those which affect the workmen directly or the terms or conditions of their employment.

It is believed that much has been accomplished at the Watertown Arsenal in respect of the features now proposed to be introduced at Rock Island, to wit, those which concern the systematization of the method of putting work into the shops, so that orders for manufacture now go from the office to the shops with a much more complete arrangement and supply than formerly of drawings, specifications, lists of parts, bills of material, and orders relating to particular parts of the structure to be produced, so that the foremen are relieved from much of the semiclerical and other office work which they used to have to do. There has been a systematization of the work of planning the course of component parts of the structures to be manufactured through the shops of the arsenal, so that this course shall be regular and orderly, and the work shall at no time be held through the lack of some component which is not at hand when needed, and so that no wasteful effects shall arise through congestion of work at particular machines, or the idleness of other machines or workmen while waiting for the assignment of operations which should have been planned for them in advance. There has been installed a planning room equipped with personnel and appliances for the regular production of what might be called the time-tables of the thousands of pieces which must travel through the pattern shop, the foundry, the forge shop, the machine shop, and the erecting shop on their way from the stage of raw material to that of finished product without collisions or unnecessary delays. They have systematized the issue of material for manufacture from the storehouses to the shops and have placed the task of estimating the amount of material required among the duties of persons other than those who are to make use of the material in manufacture, so as to reduce the likelihood of overestimates, to insure the possession of the material at the time when it is needed, and the return to the storehouse of surplus material. The result has been a useful reduction of the amount of material issued for particular fabrications. It has resulted in greater care of material in store and in the accountability for it. The method pursued has resulted in greater care of machines and tools so as to preserve their efficiency. Estimates based upon the results have shown a material benefit to the Government from the changes which have been instituted there.

It would seem that there could be no reasonable objection to extending the usefulness experienced along the lines indicated to other arsenals, especially as the changes thus far put into practice in no wise affect the efforts which individual workmen are called upon to make or the method by which they are compensated.

In view of what it is proposed to do at the Rock Island Arsenal, and looking to the benefits which such systematization seems to have brought to the Watertown Arsenal, I do not fell justified in acting up apprehensions of what may take place in respect to other features and forbidding the installation of improvements whose value has already been demonstrated.

Very respectifully,

J. M. DICKINSON, *Secretary of War.*

Mr. BUCHANAN. I would like to ask you this question: You stated to the chairman that this system had not been installed in its entirety anywhere; did you have in mind only the departments of the Government when you made that statement?

Mr. ALIFAS. I was speaking of Government work. The gentleman who introduced this resolution was the one who stated that it had been installed somewhere.

Mr. PEPPER. It has been tried in any number of private establishments, and in many places it has been found impracticable.

Mr. LEWIS. Can you give us the names of the establishments where it has been tried and found wanting, so that the committee can call upon them for information.

Mr. ALIFAS. I can not give you a list of all of them.

Mr. LEWIS. Will you later submit a list of them to the chairman?

Mr. ALIFAS. Yes, sir.

I wish to state that I have talked longer than I expected to do, and my talk has been rambling because of the interruptions from gentlemen present. I am not used to speaking under such circumstances and the interruptions caused me to lose the train of thought, and it may be that I have not presented the case in the best way that I would be capable of doing otherwise.

I wish to say in conclusion that some of the reasons why this committee should investigate this question are that they have put a time limit on work and limits in other things. The United States Congress has put a limit on the time of work and has provided a working day of eight hours. If physical endurance is to be the test, and that seems to be Mr. Taylor's intention, it would not be necessary to limit the working day to eight hours, because you could possibly find men who would be willing to work 12, 14, or 15 hours, and you could find men who might say that they enjoyed it. Besides, we have speed laws to prevent people from exceeding a certain speed limit with automobiles. We also have child-labor laws to prevent the employment of children under a certain age, and it is all for the purpose of curbing the greed of individuals who desire to make money out of the efforts of other people. It seems to me that this matter should be thoroughly investigated for the reason that if the system is inaugurated in a Government plant it will be a strong incentive for private manufacturing concerns to adopt the same system, and, while the Government might not convert its workmen into mere machines, the private manufacturer would be liable to do so and push the thing to the very limit. It seems to me that there is no surer way of causing extensive trouble in this country than to introduce a system of that kind.

I will conclude my remarks, as there are other gentlemen here who wish to be heard. I thank you, gentlemen, for your attention.

The CHAIRMAN. There are other gentlemen present who desire to be heard; Mr. Gompers has considerable information on the subject, and so has Mr. O'Connell, and they desire to be heard; and there are some other gentlemen who desire to be heard. It would possibly require one or two more hearings to give all of these gentlemen who desire to be heard that opportunity.

Mr. VREELAND. I move that the committee adjourn until 10 o'clock tomorrow morning and continue the hearings.

(Accordingly, at 12 o'clock noon, the committee adjourned to meet to-morrow, Saturday, April 29, 1911, at 10 o'clock a. m.)

HOUSE OF REPRESENTATIVES,
THE COMMITTEE ON LABOR,
Saturday, April 29, 1911.

The committee met at 10 a. m., Hon. William B. Wilson (chairman), presiding.

The CHAIRMAN. The committee will come to order. Mr. Gompers, are you ready to proceed this morning?

Mr. GOMPERS. Yes, sir.

STATEMENT OF HON. SAMUEL GOMPERS, PRESIDENT OF THE AMERICAN FEDERATION OF LABOR.

Mr. GOMPERS. Mr. Chairman and gentlemen of the committee, I urge that the resolution now under consideration be reported favorably to the House and adopted, and the committee authorized to make an investigation into the subject or the scheme of what has become popularly known as the Taylor system.

During the statement made yesterday by the representative of the employees of the Rock Island Arsenal, some questions were put to him, and the statement was made that it was perhaps unnecessary to read from the book from which he quoted, because it was in print and could be read by every member of the committee. That is very true, but I think it is also true that the Members of Congress are usually very busy men, and if it is expected that each Member of Congress is going to read all that has been written on all the subjects coming under his consideration, he could live a long lifetime and then be scarcely prepared to deal with any one subject fully and comprehensively. I think it is the duty of any man appearing before a committee of Congress to try and point out the essentials of the subject for the consideration of the committee. What better authority can be submitted than the book which bears the author's name—the author whose name is identified more than the name of any other man with the subject under inquiry? These books are entitled "Scientific Shop Management; the Taylor System of Efficiency," and so forth, the quotations from which were amply submitted to you yesterday.

Mr. SMITH. Would you allow one question? You ask the question, What better authority could be presented than the book itself—do you mean as to the theory?

Mr. GOMPERS. In substantiation of that theory.

Mr. SMITH. But would it not be well to have evidence from some one who is employed under the system and who knows of its practical workings?

Mr. GOMPERS. Yes, sir; but if I did not have more regard for your time and patience, I would submit to you evidence from this book that organization among the working people under the operation of this system is practically impossible, and that the spirit of independence or self-assertion, in order that the men may present their side of this subject, is wholly eliminated by the system itself. These books are not difficult to obtain.

Mr. SMITH. I only mentioned that for the reason that a great number of theories are presented by books that are not practical at all in operation.

Mr. GOMPERS. That is true. I want to read two brief passages from this book by Mr. Frederick W. Taylor on Shop Management.

The matter I desire to read appears upon page 1396, paragraph 253. I quote:

> Until very recently in the organization of work he has found it best to first introduce five or six of the elements of functional foremanship quietly, and get them running smoothly in a shop before calling attention to the principle involved; and when the time for this announcement comes, it invariably acts as the proverbial red rag on the bull.

Mr. BUCHANAN. Will you have noted the page and paragraph you are reading from?

Mr. GOMPERS. I have already given that. The other statement I desire to read from Mr. Taylor's book is contained on page 1480. In answer to a question by Mr. Hawkins, who is seemingly not satisfied with the results, for he [Mr. Hawkins] says: "I have waited six years now." Mr. Taylor makes this reply:

> Have you tried the incisive plan of centering on one man, instead of going at the whole shooting match at once? I think the failure is due to a lack of patient persistence on the part of the employers and then to a lack of centering right on to a single man. No workman can long resist the help and persuasion of five foremen over him. He will either do the work as he is told to or leave.

Mr. VREELAND. What were they trying to have the workmen do under that?

Mr. GOMPERS. To speed up to the very top notch.

Mr. MAHER. Is not the last thing there the task system?

Mr. GOMPERS. That is one of the elements of the system.

Now, gentlemen, I am sure that you have in mind the statements made by Mr. Alifas yesterday, and I shall not repeat them. I want only to say in connection with them that the book is available. I think that the gentlemen who advocate this system—the Taylor system of shop management as understood by the Taylor system—ought to join with us in an effort to have this subject thoroughly investigated by a committee of Congress. If the system is all that the advocates of it claim for it, then no greater advertisement of, and no greater impetus to, that system could be given than would be afforded by the indorsement of Congress. On the other hand, if it results in what we believe or know or apprehend, then it ought to receive the condemnation of Congress and the abandonment of it by its promoters. So that, apart from the merits of the system, authority to investigate the system ought to be conferred by Congress.

Let me say just this: It is conceded by every thinker and observer that in so far as quantity is concerned, the products of the United States far transcend that of any other country, but it is equally true and undeniable that in so far as quality is concerned, we have lagged in the rear.

The CHAIRMAN. In speaking of the quantity of production, do you mean the production per individual employed, or in the aggregate?

Mr. GOMPERS. In both—per man and in the aggregate.

The CHAIRMAN. In a given length of time?

Mr. GOMPERS. Yes, sir; in a given length of time. Men who have given this subject serious consideration have tried by various schemes to get to a condition where quality shall also be considered as one of the elements in production. Some will say, let us go back to the old times of hand labor; but, of course, that is out of the question in our modern civilization. But there are others who say that with the division and subdivision and specialization which has gone in the

industries by reason of inventions, new machinery and new tools, that there should be a system of industrial, vocational education.

Mr. LEWIS. Is it not true that comparisons have been instituted between the United States, Germany, France, and England, which showed that the product per man in the United States was the highest and that the quality of the product was the lowest of the four nations concerned?

Mr. GOMPERS. That has been demonstrated time and again, and the official figures from all sources verify that fact.

I want to come for a moment to this subject of the industrial and vocational education as an element in trying to overcome the difficulties and shortcomings which have resulted from modern industrial conditions. Now, there is a bill in Congress providing for the expenditure of considerable sums of money, in addition to State appropriations, for industrial and vocational education. It is the idea of putting men's brains into operation in order that they may do more and better work—in order that they may be able to do more and better work. We have been for years importing men from foreign countries to take the places of superintendents—that is, men who have been all-around mechanics and who have received industrial education in their own countries, fitting them for just such positions as that in our country. Now, because of the rush for profit and dividends on the part of employers and companies in this country, we have neglected this side of the mental development of the workmen, in order that he may be a better producer in quality as well as in quantity. Now, this Taylor system, it appears to us, is the very antithesis of industrial education, because it robs the man of initiative. Now, we can all understand and appreciate such business management as will obviate duplication in work, prevent the waiting for material, and provide that the materials shall be at hand, that the bookkeeping shall be simple and expeditious, and that the work shall be turned out in the easiest way and in the shortest possible time. These things are all right, but it is a bad system under which all of the thinking and planning is done in the office and under which the man at the wheel or lathe or machine is robbed of all opportunity to think for himself; where he is not permitted to think out any problems in mechanics, but is driven to the fullest top notch of his physical and mental endurance. Let us consider the men whose names are known to us and are upon our lips as the greatest inventors of machinery and useful appliances. Is it not a fact, though perhaps not generally known, that behind these men whose names bear the title of inventors is the man at the lathe, the machine, and operating table of industry? Take the incentive away from the man, drive him at the top notch of speed, and he has to do what he can to keep up, and then for a very short time at that.

I do not know whether I ought to say anything in regard to some matters that are pressing for expression. I do not know whether I shall have another opportunity to appear before the committee; circumstances are such that no one can tell whether I may have an opportunity to appear before the committee again for probably a year. I do not know, and I am anxious to say a word to you now because of that fact. The subject upon which I would like to submit a few words deals in a way with the merits or with what we know to be connected with the inauguration of this system. It would not take more than 10 minutes, probably.

The CHAIRMAN. There is no objection.

Mr. GOMPERS. I want to call to the attention of the committee the fact that Mr. Taylor, who is the inventor of the system with which his name is associated, "Scientific Shop Management," says that he first developed his idea in the Midvale Steel Co.'s plant. Now, I want to read to you some testimony which the president of this Midvale Steel Co. gave before this committee, the Committee on Labor of the House of Representatives, on Thursday, March 1, 1900, and which is printed in the hearings of the Committee on Labor, pages 65 to 94. On page 72 Mr. Harrah, the president of the company, answers a number of questions and makes some statements in connection with them. Mr. John J. Gardner, who is now a member of this Committee on Labor, was chairman of the committee at that time, and this colloquy ensued:

The CHAIRMAN. You stated a while ago, or I understood you to state, that when you worked them in eight-hour shifts each man worked the entire eight hours?

Mr. HARRAH. Yes; but we were experimenting then, and we had our inspectors watching the men very close, so as to see that there was absolutely no time lost. We had men with stop watches over the workmen working on an axle lathe, or whatever else it might be, and every time a man looked up they took his time; every time he stopped to breathe they took his time, and in that way they got absolutely the amount of time employed in doing a certain amount of work. * * *

In economics I am a free-trader; in politics I am a Republican; in religion I am an Episcopalian, and in theory I am a Socialist. I am following the lead of the President. Now, I believe it is only a question of time when we will have an eight-hour labor law, but it will not be a law on the statute books; it will be a custom—that is to say, we all work too much. * * *

Mr. GOMPERS. Are they (the workmen) permitted to leave the mill to take meals?

Mr. HARRAH. No, sir. Once a man passes inside the gate and gets inside the red fence, he stays there until his day's work is through. * * *

Mr. GRAHAM. I was going to ask whether you thought that you could put your machines so as to accomplish getting out more work in eight hours than you can now in nine hours?

Mr. HARRAH. No; the machines are worked to their fullest capacity now.

Mr. GRAHAM. You would have to get some kind of improved machinery?

Mr. HARRAH. We have the most improved kind of machinery now; but we make it a rule to run a machine to break. For instance, the life of a hammer bar may be two years. If that hammer bar does not break inside of the two years I go for the forgemaster, because I know he is not getting the work he ought to out of the forge. It is the same way in the machine shop. If a lathe, the natural life of which might be two years, does not break down before that, I would go for the engineer in charge.

Mr. GRAHAM. Everything is run to its full capacity now?

Mr. HARRAH. Absolutely; yes, sir. We have absolutely no regard for machinery or for men.

Mr. GOMPERS. I think every member of the committee feels under obligation, I am sure I do as one of the men interested in this investigation, for the gentleman's frankness as to his——

Mr. HARRAH. Will you tell me your name? My name is Harrah.

Mr. GOMPERS. My name is Gompers.

Mr. HARRAH. Mr. Gompers, when you become better acquainted with me you will know that there is nothing I hold back. I am like you; I am very anxious to have this thing settled. It means a great deal to me.

Mr. GOMPERS. So anxious am I to have it settled that I have associated myself with my fellow-workers in order to see that it is settled. You say that in the event of these hammers and lathes not being broken down much before the supposed limit of time they should last, you find fault with the men because they haven't got as much work out of the machines as they possibly could?

Mr. HARRAH. Yes, sir. * * *

The CHAIRMAN. Do you know whether Mr. Taylor was in charge of the Midvale shops at that time?

Mr. GOMPERS. He was in charge of a large part of it, and he graduated into a higher position.

I do not know whether you gentlemen, on the morning of April 16, saw in the newspapers the horrible story about the large number of men who were killed and of others who were burned to death and injured by burning by reason of a plug coming out of a tank which contained tons and tons of molten steel in the Midvale Steel Co.'s works. It might be an interesting story to see whether there is any connection between this accident and this sort of system——

Mr. LEWIS. I would suggest that you incorporate it in the record because there may be some connection between the intensity of action in labor and liability to accidents.

The matter referred to is as follows:

[Washington Post, Apr. 16, 1911.]

SIX DIE IN MOLTEN RAIN—STEEL POURS OVER WORKMEN IN MIDVALE PLANT—ONE OTHER CAN NOT LIVE.

TWELVE MORE INJURED THROUGH BURNING OUT OF A CRUCIBLE AND SUBSEQUENT UPSETTING OF BIG CONTAINER—ONE MAN BURNED TO CRISP AS HE STOOD—VICTIMS OF ACCIDENT SUFFER TERRIBLY.

PHILADELPHIA, *April 15.*

Six workmen were killed, 1 was fatally injured, and 12 others seriously hurt at the Midvale Steel Works, at Wayne Junction, this afternoon, when a huge container filled with molten steel gave way, the fiery liquid pouring or splashing over more than a score of the employees.

The dead: James Tobin, head stamper, 44 years old; Patrick Perrin, foreman, 43 years; Patrick Joyce, 24 years; Patrick Myers, 35 years; Michael Panas, 42 years; George F. Steel, superintendent. Fatally injured: Patrick Cunningham.

Among the seriously injured in the hospital and who may die is Bryan Glynn.

HOW ACCIDENT OCCURRED.

The accident occurred in what is known as open hearth No. 1. Several tons of the molten metal had been poured into a huge container, and it was being slowly propelled along a traveling crane across the shop to waiting molds. More than 20 men were under and around it, guiding the huge vessel with long tongs, when, without warning, a plug in the bottom of the container burned out, and the molten steel instantly began pourning through the hole. It spluttered and splashed over some of the men, and they were compelled to let go of the tongs.

In thus releasing their hold the huge kettle became unsteady, and in the next instant it tilted over and poured down a solid stream of molten steel. Seven of the workmen were caught almost directly under the full flood of the fiery stuff, but all except one. James Tobin, managed to get from under the container. Tobin dropped in his tracks and burned to a crisp.

MEN TERRIBLY BURNED.

The big whistle of the Midvale works brought prompt assistance, and those who were not seriously burned were treated in the emergency hospital within the works, while ambulances rushed the others who were horribly burned, to the Germantown Hospital. A quick examination showed the physicians that nothing could be done to save 6 of the men, and 5 of them died within a short time of one another to-night.

The physicians say there is no hope for Cunningham. All the victims taken to the hospital were in a terrible condition. Their clothing was burned, and in taking it off patches of skin and flesh came with it.

You will observe that Mr. Harrah says that when men are inside the gate, they are in there until the day's work is done. You see the principle of the thing and the result of the thing in the Triangular

Shirt Waist Factory fire in New York, where 150 women were locked in and could not get out until their day's work was done, and they did not get out until the grim destroyer burned them.

I grant you that if this Taylor system is put into operation, as we see it and as we understand it, it will mean great production in goods and things, but in so far as man is concerned it means destruction. So long as the supply of human labor is not exhausted the system can go on. I mean by human labor not only that now in the United States and not only that on the American Continent, but I mean labor from wherever the supply can be brought. It is producing wealth but grinding man, and, while I think we all agree that production is one of the essentials of life and that while greater productions must go on in order to satisfy our growing needs, there are other considerations of a primary and more important character, and that is that the intelligence, that the physique, that the spirit, the mind, hopes, and aspirations of man shall be also cultivated and given an opportunity for higher achievements.

Why should employers want a system that preys upon the independence, the development, and the character of the worker? This last statement by Mr. Taylor, in reply to the query, discloses at once the idea. It is that four or five formemen shall stand over a worker and by a species of industrial "third degree" compel obedience. Consider this same principle as applied to the operation of railroads. Some engines can not be run more than 20 miles an hour; others run 40, 50, or 60 miles an hour. How about this so-called production or the accomplishment of 300 per cent more upon the railroads? The engineer, because he is trained, runs his engine as fast as he is told, and sometimes faster than he is told, but as fast as he is expected to run it. The street-car men operate their cars upon schedule. Workers in the United States in every industry of which we know anything, or, at least, of which I know anything, work harder, quicker, and more effectively, so far as results are concerned, than the workers in any other country. When workers from foreign countries come to the United States for the first few months they are simply dazed with the rapid motion and the great production of the American worker, and it is only after months and sometimes a year before they can acquire the same movement. Sometimes they never attain the rapidity of movement and effectiveness of result possessed and demonstrated by the American worker. If we had a dearth of workers, if our production lagged, if we needed as essential to our well-being all these things, they might be justified for a time. But there is no need; we produce and can produce with economy applied all around and under a humane system of management all that is required. I wish to say this for the men of labor—and I speak not only for the men of labor, because I am a worker myself—I worked at my trade for 26 years and I have a right to speak as a worker—that there are some limits beyond which we will not allow you to go with your domination as captains of industry. You are our employers, but you are not our masters. Under the system of government we have in the United States we are your equals, and we contribute as much, if not more, to the success of industry than do the employers. We are not bent serfs nor docile workers; we give the best that is in us for the wage that we receive, and we bend no knee, neither politically, socially, nor industrially. We propose to have

our voices heard in any discussion of the conditions under which we shall labor. Nor are we going to permit, without a protest, the introduction of a system that places a premium upon a man's mere vitality, to be exhausted to the fullest, to the neglect of his own well-being in all respects.

Mr. Chairman, I want to thank you and the gentlemen for the courtesy of listening to me. I only hope that the resolution may be voted upon favorably and passed by the House.

Mr. HENSLEY. Mr. Gompers, before you conclude, I would like for you to submit just a few remarks on the subject of mechanical inventions; that is, whether the Government protects such inventions for the purpose of encouraging inventions generally and, also, for the purpose of relieving labor of some of its burdens. That thought just occurred to me, and I would like to have your ideas upon that subject.

Mr. GOMPERS. The theory of Government protection for inventions in the form of patents is the recognition, first, that the invention itself, or some of its advantages, ought to revert to the inventor because of the benefit that the invention is supposed to give to society. But even in the governmental guaranty of protection to the inventor there is a limitation of time, for it is recognized that after a specified period of time, I think about 17 years, the benefit of the invention must revert to all the people, and that the inventor has no further claim to protection. It is, as suggested by your question, protection to the inventor, and the provision that it shall finally become public property is intended to be of service to the people and to lighten their burdens.

The CHAIRMAN. Some time ago I ran across an article—I do not recall now what it was—that treated of the effects of the strain and constant application of the workers under the English factory system upon the workers themselves and of the physical deterioration that has taken place in the English or British wageworkers during the past 100 years as a result of the introduction of the factory system and the strain incident thereto. Do you know anything of the results of the system generally?

Mr. GOMPERS. The results were first demonstrated during the Boer War—that is, it was first demonstrated in that war in recent years, although it had been demonstrated before that time. In that war, when the Britons were appealed to to enlist in the war, the measurements taken by the representatives of the military authorities showed a diminution in the stature of the British workmen in many industries. Their chest measurements, their height, and weight were found to be entirely disproportionate and had deteriorated. A few years ago, when I went to Europe as the representative of the American Federation of Labor to the International Congress of Labor, I visited a number of factory cities. Among them were Manchester and Leicester, Liverpool, and other places too numerous to mention. I went also to Blackpool, where the British trade unions were having a congress. Blackpool is known as the poor man's watering place and corresponds to Coney Island in New York. There the sight of the weazened, thin-chested, and undersized men, women, boys, and girls was most impressive. In a conversation with a newspaper representative there, I called his attention to what was quite patent to me and asked him whether it was general. He said: "Yes, that is general; and think of it, that these boys and girls are

to be the fathers and mothers of future Britons!" The industrial status in Germany was most marked by the physical development of the Germans. This is due to the fact that in Germany more consideration is being given to the industrial condition of the worker, because it is contemplated that the German worker shall be developed into the German soldier. Instead of being bent-over, narrow-chested, low-browed men, the industrial and military conditions of Germany have made the German physically a better and bigger man and have made him hold his chin in the air. I am not trying, however, to extol the German army system or any military system.

The CHAIRMAN. I understood from a statement made by you heretofore that the production in this country per man in a given length of time is greater than in England.

Mr. GOMPERS. Yes, sir.

The CHAIRMAN. Our industrial system is not as old as that practiced in England.

Mr. GOMPERS. No, sir; it is not, by many decades.

Mr. VREELAND. Is there not some limitation on that? While it may be true that production in the United States is larger than in that country, is it not because we make gerater use of machinery, and is it not true, also, that in trades where handwork must be employed that we are unable to compete with many of the countries across the sea?

Mr. GOMPERS. We have done so by both methods. We have applied machinery more generally than in any other country, and, therefore, our production is greater; but in addition to that it has also been demonstrated in all the activities of the workers in America, even in trades where machinery is not employed, that our production is greater.

Mr. VREELAND. As an illustration, take the watch industry: Where we use machinery in the manufacture of watches we can, of course, make them, and we do export a great quantity, but when you take the high-priced watches, on which a great amount of hand labor must be expended, we do not undertake to make them.

Mr. GOMPERS. Oh, no; the watchmaking industry is one of centuries of study and close application, as in Switzerland; but we have never applied ourselves very seriously to the making of watches by hand; ours has been the machine production. As an illustration, take my own trade. Now, the best class of that work is done by hand, purely handwork, but there is no country on the face of the globe where hand workmen in that trade produce as much as we do in this country.

Mr. BUCHANAN. Is it not a fact that in this country the greatest amount of efficiency obtains where workingmen are paid the highest wages and work the shortest hours? Under these conditions, do they not perform the greatest amount of labor consistent with the character of work they are doing?

Mr. GOMPERS. There is no question about that, Mr. Buchanan. But, after all, the truth is that a man of a high order of intelligence will drift to a trade of that character, where the highest wages, shortest hours, and best conditions prevail. Such a system not only does that, but it also has the effect of developing the character of the men who are enjoying better conditions than obtained before. I know that is true in many trades, and it is true in mine also.

Mr. SMITH. Are the men employed at the Rock Island Arsenal pieceworkers?

Mr. GOMPERS. I think not, sir.

Mr. ALIFAS. They work both ways.

Mr. GOMPERS. I should say in the matter of the Rock Island Arsenal that there are probably some gentlemen present who are better qualified to speak of it.

Mr. SMITH. In reading over that pamphlet, do you think there would be any serious objection to it by laborers on piecework?

Mr. GOMPERS. I think so.

Mr. SMITH. They would have their time under their own control and would be different in that respect from men who were working by the day.

Mr. GOMPERS. People who do piecework have very little more control over their time than those who work by the day. The men must occupy a certain amount of space and use the machinery, etc.

May I volunteer a statement that came to me in a rather circuitous way as one of the things incidental to this so-called efficiency system? On yesterday the time-unit proposition was discussed and some question was asked as to whether attendance at work was included in the elements that go to make up the system. Now, of course, it is generally known that in the event of any great trouble with a workingman, even if he is working for a pretty heartless concern, the employer will have some consideration for him, especially if he has some domestic trouble. Now, in the Rock Island Arsenal a man was absent from his work and he could not communicate with the arsenal authorities. His boy was down with diphtheria, and the house was quarantined and isolated. In about a week the boy died; the house was fumigated and some of the clothing destroyed. The man had to give two days to that and to the burial of his boy. He reported back for work and was marked for demotion and a reduction in his wages by reason of his absence.

Mr. PEPPER. I may say that the gentleman who sat over here on this side yesterday is the man who had that experience.

Mr. GOMPERS. It came to me in another way.

Mr. VREELAND. Is he still demoted?

Mr. GOMPERS. His demotion in rank reduced his wages by reason of the absence. Of course, one might say that that is an incident; that is one of those human incidents or a part of human life. All of the stories depicted by Harriet Beecher Stowe in Uncle Tom's Cabin did not generally prevail in the slavery system of the South, but these incidents related by her were sufficient to arouse the conscience of the people, and this incident of inhumanity I have just referred to is an incident of that character. The question is, if you do not come up to the top notch, no matter what the cause may be, you have to suffer for it.

Mr. VREELAND. According to your observation, are not incidents of the kind you have referred to very rare?

Mr. GOMPERS. I say that in places where that system would not prevail, the employer would say: "This man has had enough trouble without my reducing his wages and his standing in my employment." Probably, if he had a little of the milk of human kindness in his nature he would pay him his week's wages.

Mr. VREELAND. It seems almost incredible, in my experience, which however, has not been large, that a man should be punished for a thing like that.

Mr. BUCHANAN. I have recently taken up with the Post Office Department the case of a mail carrier who had become overheated while carrying the mail in the city of Chicago. He asked for a leave of absence for a year on account of it, but at the end of that time, because he had not regained his health sufficiently to satisfy the department, he was not permitted to go back to work. I have taken that matter up myself, and know of it. I know that is the system.

Mr. GOMPERS. I submit the statement of the author of this system, in which he says he intends to introduce it quietly, secretly, and slowly, because otherwise it will arouse such opposition as may be compared with the shaking of a red rag before a bull. Now, I submit, that before that system should be adopted by the Government of the United States in its own works the subject ought to be fully investigated.

Mr. VREELAND. I have heard a great deal in the past few years about increased efficiency in manufacturing establishments, but I did not suppose that it applied particularly to what has been called the speeding-up process—that is, by a method of making work harder. I supposed that it would apply more to the matter of preventing waste, promoting a more careful study of the details of the business, and the cutting out of unnecessary steps; in other words, not to call for a greater expenditure of energy on the part of a given workman, but to see to it that his energy is directed toward making the product on which he is engaged. I asked the question yesterday in relation to the book, because I did not suppose that this committee was going to investigate a book. I supposed that it was the practical application of it in Government institutions that the committee would investigate. Now, I have read some of the book—that is, what I had time to read in the evening. Are there not some good ideas in it?

Mr. GOMPERS. I would like for you to particularize before attempting to give an answer to that question.

Mr. VREELAND. I mean as to what the author states to be his purpose in writing the book, in which he says: "This paper is written merely with the object of promoting high wages and low labor cost." I suppose that all will agree that that is desirable.

Mr. GOMPERS. The question is how the high wages and low labor cost are going to be effected. There are several ways by which it can be done. For instance, if you want to get the best work, if you want to get the largest amount of work out of a man and pay him the highest wages in the shortest possible time, then work him 24 hours continuously. By this means you have given him higher wages and you have gotten the greatest product out of him.

Mr. VREELAND. I would not agree that that would be a sound economic method.

Mr. GOMPERS. But it would be the largest product you could get out of one man in the shortest possible time; while that would be true, stated without the conditions surrounding it, yet, when sifted, it would be found to be absolutely unjustifiable and improper. If

you want to get the largest amount of work out of a man for a period of 10 or 15 years work him 10 hours per day, but if you want to get the best out of a man for a period covering a reasonable lifetime 8 hours is the proper working day for him. Then you will give him the highest pay, as well as an eight-hour day; you will give him the best possible working conditions; and, man for man, in that industry, you will produce as much, if not more, as the man in the same industry working nine hours a day.

Mr. MAHER. Is it not possible, under the eight-hour system, for a man engaged on piecework to so speed himself for those eight hours as to injure his health if he continues?

Mr. GOMPERS. That is true; but that is better than 10 hours, because he could use the two hours for recuperation.

Mr. MAHER. It has been proved that under the eight-hour system a man may so speed himself in doing piecework as to injure his health and become prematurely old at 40 years.

Mr. GOMPERS. I have found that to be a fact.

Mr. Vreeland, you spoke about planning the work of a factory so as to avoid the taking of unnecessary steps. Now, that is very true so far as steps are concerned, but it is also true that the time that a man ordinarily devotes to extra steps or an extra motion is frequently that moment when the divine spark of a new thought comes to him. If it had not been for the fact that Watts had time to watch a kettle boil, we might not have known of the power of steam. If Edison had not tried to get some sleep in the company's time and invented the electric bell that aroused him from his slumber, we might not have the advantage of the duplex system of telegraphy. If Franklin had not had time to fly his kite and study electricity, we might not know of the telegraph. That brief leisure time, the minute, the half minute, or the 10 seconds of mental and physical relaxation is necessary in order to get the best results. You know in your experience in Congress that you must change the stenographer every now and then if you want to get the very best work out of him. If you go on talking for three quarters of an hour, as I have done, the stenographer does not mind it, because he has a chance to think between my words.

Mr. VREELAND. I will agree with you upon this proposition, that it is desirable to get the shortest number of hours for working people and everybody else that we can get along with and supply ourselves with the necessary products, but is it not desirable for men who have developed expertness in that line to study the question of the waste of energy? I am not talking about speeding up the man and making him trot with the wheelbarrow; I am talking about complicated methods of work and the study of experts to eliminate useless waste of energy in doing the work. Certainly no one could have any objections to that sort of increased shop efficiency.

Mr. GOMPERS. No one objects to that and all that it implies.

It is very difficult for any one to appreciate the workingman's position, the workingman's point of view, and the workingman's situation in a factory when at work. We may hear of this and read of it. There is no mysticism or mystery about it, but there is that state of feeling which no one can understand thoroughly and absolutely unless he has been a factory workman or a wage worker in an industrial plant. Is it imaginable that our great captains of indus-

try have gone on for these past 10 or 20 years without taking advantage of every opportunity for real efficiency? If I were in the business of stigmatizing things, I would say that a most excellent word—efficiency—has been used here in order to carry through a very crafty proposition.

The CHAIRMAN. Admitting that this Taylor system does accomplish a high wage rate at a lower labor cost, would you then consider that that is all the wage worker is entitled to, or that there is nothing else to which he would be entitled but to a higher wage rate that would enable him to live?

Mr. GOMPERS. I should say no; that that is not all he is entitled to. He is entitled to a full share of his increased productivity.

The CHAIRMAN. But aside from the productive part of it, would you not consider that the wage worker has some brains, and growing out of that brain some sentiment, some notions of liberty, and some conception of his personal prerogative and of his rights as a citizen and a man?

Mr. GOMPERS. Yes, sir. There are no workmen who object to superintendence; but they do object to such domination as would make the position of the workman practically so docile that he does not or can not say anything in his own defense. The workmen of our country are usually very easy to handle, and if you handle them with consideration you will get the best results out of them. If they are handled solely with a view of wringing profit, unsatisfactory results will be obtained. The American workman has come to consider that he is something more than a worker, or, rather that he is not alone a worker; that he should not be regarded solely as a wealth producer, but that his character, manhood, and his rights, his life and opportunities are entitled to proper consideration. These demands are being made upon modern society, upon the employers of the country, and upon the Government—municipal, State, and national. It has been a struggle for ages and ages—the struggle of the masses to attain that degree of recognition that they are not slaves or sergs, but that they are men entitled to every right with their fellow citizens as men. This Declaration of Independence of ours means something in 1911 to the workingmen of America, even if it does not mean much to men occupying other positions in life and who regard the declaration simply as a string of glittering generalities. We are trying to make these principles a rule of our every-day lives.

Mr. VREELAND. Are there not a good many concerns in the country that advertise to furnish expert men to go to manufacturing plants and inaugurate improved methods—methods that will result in greater efficiency and avoid waste of time and energy?

Mr. GOMPERS. Yes, sir.

Mr. VREELAND. Has Mr. Taylor done anything more than to collect together a lot of things that have been supplied to these concerns for a great while? I see that paper was written in 1903—8 years ago. Is there anything new in this, or has he simply collected them together and put them in book form?

Mr. GOMPERS. It is something new and far-reaching; at least he so claims. If you have read the book carefully you will find that much of it consists of discussions between Mr. Taylor and a number of employers of labor in regard to this subject. A few who were par-

ticipants in the conference at which this discussion took place had their own systems which they called efficient shop management, and they would not accept his system as a substitute for theirs. But, whether justifiable or not, the fact is that the system has become to be known as the Taylor system. I suppose, as a great engineer, Mr. Taylor is entitled to great consideration and credit, and anything he might say would have weight, but the question of dealing with men is a somewhat different proposition from dealing with exact measurements and machines.

Mr. VREELAND. That is true.

Mr. GOMPERS. I thank you, gentlemen, for your attention.

STATEMENT OF MR. JAMES O'CONNELL, INTERNATIONAL PRESIDENT OF THE INTERNATIONAL ASSOCIATION OF MACHINISTS.

Mr. O'CONNELL. I want to acquiesce in Mr. Gompers's statements, that we can not appreciate that there should be any opposition on the part of Mr. Taylor or anyone else connected with his scheme to a full investigation of it by this committee, because if the system amounts to anything it will stand a public investigation, and opposition to an investigation would be convicting the proposition before the committee and the country. I am sure that no one will appear before this committee in opposition to the passage of this resolution; I feel that that position will not be taken by anyone. As the committee has only to consider the question of recommending the passage of this resolution by the House, it may not be necessary to go into the details or the merits of the proposition itself, except to give the committee some idea as to what the system is in order that you may be in a position, if you see fit, to report favorably on the resolution, and to give your reasons for so reporting.

The Taylor system is not a new proposition by any means. Mr. Taylor has written a great deal on the subject. I refer you to three articles written by him quite recently. These articles appear in the March, April, and May numbers of the American Magazine, and are accredited to him.

Mr. LEWIS. Do these articles modify the system as described in this book?

Mr. O'CONNELL. No, sir; I think they strengthen it; he is trying to strengthen it, at least. In one of these articles, published in the May issue of the American Magazine, he sets forth that the system has been in operation, or that he has been working on it and trying to put it in force, for 30 years. So that it has been for 30 years in application in some form or other. It is therefore not a new proposition. In this same article, however, or in one of them, he has stated that there are approximately about 50,000 people working under the system. So that in 30 years this wonderful scheme is one under which he has succeeded in inducing the employers of labor of this country to the extent of about 50,000 men out of probably thirty or forty million men to adopt. As was stated to you yesterday at the Watertown Arsenal, where the system has been in use for a couple of years, it has only reached a very small percentage of people employed in the arsenal. I suppose that he means to include in the figures he gives of 50,000 men all the men who are employed in and around the Watertown Arsenal—that is, he means to say that they are employed under the Taylor system.

Mr. VREELAND. Was Mr. Taylor employed and did he go to the Watertown Arsenal to institute the changes there?

Mr. O'CONNELL. Yes, sir. Mr. Taylor's plan is this: He will come to your establishment and say to you: "I want to look over your factory." After looking over it, he will say that he finds that you have a great amount of waste in every line of industry in your factory. Then he will say: "Now, I will put into effect a system that will be the means of saving you a great deal of money, and it will cost you so much. I will put a man here, an expert in this line of business, who will successfully put this scheme into operation for you." Now, in one of these magazine articles, he says that no matter how small the plant is, do not attempt to put the system into effect completely within a year or two years or three years, or better still, not within four or five years. Why? There can be only two things that I can see that would cause the making of that statement. One would be the financial reason; but in this age in which we are living a business man can not wait five years to change his business; he turns it over year in and year out; and when machines break down or wear out, they replace them with good ones. So that it is quite plain that the real reason for the gradual inauguration of the system is to enable them to sneak into a factory or to slip into it a change of employment, a change of condition or of the mode of work or living to which the men have not been accustomed, and add something that is so absolutely unfair that were it done openly the men would rebel against it. The men at the Rock Island Arsenal, of the United States Government, 1,500 of them, when it became generally known that the Taylor system would be put into effect, these men, regardless of their trade or calling, whether mechanics or laborers, this army of men arose as one man and said: "No; no Taylor system for us. We are working for one of the best employers in the world, the United States Government; we have an eight-hour working day; the wages are as good as those paid by private employers; but we will not accept the Taylor system."

Our association, the International Association of Machinists, has the largest number of men employed in the mechanical departments of the Government—that is, about 75 per cent of them. These men at the arsenal met and appointed a committee, and that committee waited upon the officials of the War Department to protest against the inauguration of that system at the arsenal. Why? Because they did not want to strike; we wanted the men to come to Washington and lay the matter before the officials of the War Department. This committee has also called upon President Taft to-day in reference to this proposition. As I have stated, the committee called upon the officials of the War Department, and they have declared that they are now about to put this system into effect; that they mean to put it into effect at this arsenal. We now come before this Committee on Labor, because these men are employed by the Government of the United States, and you are representing the people of the United States. We say to you that this system that is threatened to be put in effect in one of the great factories of the Government should not be adopted by this Government and that these men are indiscreet in what they are doing.

We state to you that this system is wrong, because we want our heads left on us. Mr. Taylor says: "Give us strong men with big

physical bodies, but take their heads off; we do not want men with heads; we want men with big hands, strong arms, and strong bodies, but without heads. We will do the thinking for them. We do not want anybody around here who can think. We will have a man who will do the thinking and tell them when to stop work and when to start, and how much they must do, and if they do not do it, then they go out to the scrap pile." Now, that is the proposition, pure and simple. We are going to stunt manhood in the United States. We are going to prevent any higher standard of manhood being brought about in this country. We say to the Labor Committee, and we say to Congress through you, and we say to the people of the United States through Congress, that the laboring men of this country will not permit the Taylor system to be introduced in the factories in this country on the basis that Mr. Taylor proposes to introduce it. It is true that it has been introduced here and there in spots, and the great factory which is always mentioned by Mr. Taylor and by everyone who speaks about it is the Midvale Steel Works. Well, God help us if we have to work there, and God help us if we have got to work at any other factory where this system is in operation.

Mr. Vreeland asked if there were not other systems that had been applied toward facilitating business. Yes; here is another one right in this book. Mr. Brandeis talked about this system before the Interstate Commerce Commission when the hearings were on a short time ago in reference to freight rates. This system is called the Emerson system, and we have also the standard time system.

Mr. LEWIS. How does that differ from the Taylor system?

Mr. O'CONNELL. In this system they have an efficiency mark. In other words, if your efficiency is 100—if that is the standard—if you reach, say, 76 or 80, you are within the right to work, but to get a premium or to get more money you must come up to the standard or about the standard. The standard is the highest.

Then we have advocates of piecework, and advocates of the premium system, and gang profit-sharing system, and several others. If we oversleep ourselves, some morning we will wake up in an entire new industrial proposition in this country. We ask you, gentlemen, without consuming more of your time, so far as I am concerned, because the subject has been fairly well covered, to report this resolution favorably, because we hold that it has within its make-up no higher authority for it than the man whose name it bears; that this system proposes to stultify our American manhood; that it proposes to stop any effort toward education of any kind, toward building up the mechanical skill and genius of our time and of our country. We do not want that.

Mr. VREELAND. If you are right in your statement as to what this system proposes to do, why need we investigate it? We could pass a resolution without investigation upon the statement of facts made, and certainly ought to.

Mr. O'CONNELL. Yes; but, as I say, we come to you as the representatives of the Government, because it is being threatened to be introduced into your factory. You are the boss of the job here.

Mr. HENSLEY. What impetus would it give the system should the Government adopt it in some of its departments?

Mr. O'CONNELL. It would give it the impetus of making it a practical proposition for every manufacturer of this country to say that the Government has given it its stamp of approval. The commission appointed by ex-President Roosevelt in connection with the miners—the chairman of this committee knows what impetus that gave toward that position or that decision of that committee. It was used immediately by the manufacturers all over this country because of the so-called open-shop theory expressed in that report, and they stated: "It is acquiesced in by the President of the United States and it is acquiesced in and given out by the commission appointed by him." And it became the watchword and byword of every hostile employer in this country.

Mr. LEWIS. Might not private concerns of the country, because of better profits they would make out of the employment of this system in its entirety, use it as a burden to labor beyond what the Government would use it?

Mr. O'CONNELL. Undoubtedly.

Mr. SMITH. How extensive and what sort of investigation would you suggest? Supposing such a report is made, what method of investigation would you suggest?

Mr. O'CONNELL. That the parties in interest on both sides be heard, those representing the so-called Taylor system or other systems—the mere name does not imply anything—and the representatives of labor and the laborers themselves who are working under conditions as set forth by those representing the other side, all parties in interest. I know of no subject in which the Government could interest itself to a higher degree, because, as President Gompers said a moment ago, there are bills in Congress and legislation being enacted or sought in this Congress with a view to establishing a higher and a more efficient degree of technical education and education of every kind, educating the mind as well as the hand. If we are interested in that phase of it, we certainly should be interested in something that is directly opposite to that, and this certainly is directly opposite to the education of the mind. The subject is a broad one, and every employer in this country is interested in it, and every laboring man is interested in this country, because with turmoil, with strikes, with differences between employee and employer, the public must be interested, and investigation would put either side in a position, in the eye of the public, at least, to justify their position either for or against the proposition.

I have made some study of this system and of the introduction of such schemes in manufacturing. For 20 years I have been interested in the question of piecework. I have studied it here and I have studied it abroad, and I want to emphasize what President Gompers has said. In all my experience here and abroad, in all my knowledge of the industrial world, so far as it applies to the mechanical trades, the American workman, as to skill, ingenuity, and quantity of output, has no equal, let alone a peer, on the face of God's green earth; and the employer of this country does not have to introduce schemes and systems to grind down his workmen or to shorten life, or to make it necessary for a man to compete against his fellow man day in and day out in order that he may make a fair living, and a fair employer does not attempt to do so. It is the unfair employer, in conjunction with the lead-pencil faddist, who is attempting to introduce such

schemes and isms with a view to making it appear that labor is being benefited and labor is going to receive more money. That is a huge joke. If the laborer wants more money he has to go out and get it himself. No employer is going around handing money to laborers on a silver platter. Do not let anybody tell you that. In the factories and workshops where the Taylor system and other systems aping it are in effect, labor is absolutely helpless, absolutely shackled. They are dependent because individuality has been driven out of them absolutely by that system.

Mr. VREELAND. If the Taylor system, the piece system, or any other system is introduced into a factory where there are a thousand men employed, why can not they bargain collectively so as to get their just portion of the profits, as well under one system as another? Why should that take away their power and right?

Mr. O'CONNELL. Under the Taylor system it does not permit of collective bargaining at all. There is not a statement made by him in any place except in opposition to collective bargaining.

Mr. VREELAND. Perhaps Mr. Taylor does not provide that, but the men themselves can provide it.

Mr. LEWIS. Is that an inseparable feature of the Taylor system?

Mr. O'CONNELL. Not necessarily; but we can only speak of the future with reference to things that exist now or have existed in the past. I can imagine a man, or two or three men, or a committee of men, waiting upon the officials of the Midvale Steel Co. to adjust their rates of wages. I can imagine what would happen to them. Maybe you can. They would get out of the gate before the day was up. They would not have to wait until 6 o'clock to get out. They would be thrown over the fence. They would not wait to open the gate.

Mr. VREELAND. Has the Government employed Mr. Taylor or any other one of these so-called experts to introduce a system at the Rock Island Arsenal? Is it being instituted by some one employed by the Government?

Mr. O'CONNELL. Mr. Taylor, or some one representing him, has been employed by the War Department to go to Rock Island, as I understand, for the purpose of putting into effect this system.

Mr. LEWIS. You are familiar with railroad work in the machinists' line, I presume?

Mr. O'CONNELL. Perfectly.

Mr. LEWIS. Will you tell us to what extent the product of machinists in railway work, railway-engine construction, to begin with, and also the repair of railway locomotives, to what extent such work can be sufficiently standardized into units to permit of a comparison of the work of one machinist with another?

Mr. O'CONNELL. I am of the opinion it has been so largely standardized now, so largely specialized, that there is not room for much improvement, although some of our people on the opposite side disagree very strongly with us. I think the business has been specialized.

Mr. LEWIS. I do not mean specializing.

Mr. O'CONNELL. That is practically standardizing.

Mr. LEWIS. I mean, are there accurate methods available by which the work of John Smith and John Jones in a machine shop of a

railway, and the product of their work, can be computed at the end of a day?

Mr. O'CONNELL. Yes. They have printed slips and keep a record of everything. If you work to-day boring out a cylinder on a locomotive, you put in so many hours on locomotive number so-and-so, and they know what it costs exactly. No matter what you do, the next day they can say just what it costs the company.

Mr. LEWIS. Is that true in repair work?

Mr. O'CONNELL. That is true in everything. If I go out one day for repair work on a locomotive, no matter what it is, I charge that time to that particular job, and that goes to the office and a record is kept of it.

Mr. LEWIS. You have not fully caught my meaning. A locomotive may come in in a partial state of bad repair, and it may require one degree of work in one case and another degree of work in another. What I am trying to ascertain is whether the work itself can be separated into units, quantitative units, to such a degree that one can say whether John Smith or John Jones will do the work the quicker?

Mr. O'CONNELL. Yes; every piece of work. There are some railway companies in this country that operate their plants entirely on a piecework basis. They constitute a very small per cent, however. Every piece of work, either new or repairing, has a price set for it, and that price was worked out by some method of speedometer, some method of stop-watchism, some method of a man watching and timing the man and working it out on that basis. They have what they call a time-setting committee, or a trying-out committee. That is the system of one road I know of, but I shall not mention the name of the road.

Mr. VREELAND. Is not the piece system the fairest method of paying for work?

Mr. O'CONNELL. No.

Mr. VREELAND. Provided——

Mr. O'CONNELL. No; under no circumstances. I will prejudge the question.

Mr. VREELAND. Provided they adopt and maintain a fair price for the units of production.

Mr. O'CONNELL. Experience of a hundred years in this country has taught us there is no such thing in connection with piecework as fairness.

Mr. VREELAND. Why can not the power of the workmen, acting collectively, be brought to bear just as well upon the payment they receive by the piece system as the day system?

Mr. O'CONNELL. Because it has this effect, the same as the Taylor system, collective bargaining has been driven out, the organization of men has been driven out in every way, in every capacity, and the men are helpless. They are not treated collectively, and they would not be. Piecework has driven out all methods of bargaining with them. The boss sets the price, the speeder sets the pace, the strong, stout, energetic young man sets the standard of life for his older brothers. That is piecework. The average man will probably get along for a year or two, but he is soon gone, and the old man disappears, and goes to the scrap pile.

Mr. VREELAND. I do not see why that should follow as a matter of principle.

Mr. O'CONNELL. But it has followed.

Mr. VREELAND. I can understand that the manufacturer, in fixing the rate of wages, would want to pick out the most skillful man, a man that could turn out the largest number of units in eight hours, whereas the men, working for their advantage, would take the slowest man. Now, the fair price would be a subject of agreement between those two points. Why could not your men collectively bargain just as well upon that as upon a day's wage?

Mr. O'CONNELL. There is no reason in the world why they could not, if they were permitted.

Mr. VREELAND. I do not understand they have to be permitted.

Mr. O'CONNELL. There are things we won't bargain about even collectively, in our organzation, and probably that is one of the things.

Mr. LEWIS. Is not there a sentiment among labor unions that they are brothers, and that the small differences of ability ought not to be the subject of a difference in wages; that they ought to go out of the shop as equals and come into the shop as equals?

Mr. O'CONNELL. Well, that may appear to be the theory, but it is true, nevertheless, that it is not all brotherly love, by any means.

Mr. LEWIS. Is not that the sentiment prevailing among workingmen who work together?

Mr. O'CONNELL. There is a great deal of selfishness about it when it comes down to the actual proposition. Self-protection does not permit me to stand idly by and permit you to be imposed upon and have your wages reduced and your hours increased and your condition of employment imposed upon. I must expect soonor or later to suffer the same thing. That is very largely one of the things which makes us brothers. We are brothers in this proposition against the Taylor system.

Mr. VREELAND. You are an expert, and I would like to ask you a question, although it may not bear especially upon the hearing. In your opinion, how much truth is there in the assertion recently made that a very great economy could be made in the conduct of railroads by following the example of the great industrial concerns, if modern methods were applied?

Mr. O'CONNELL. I imagine there are opportunities for great economy, but from what I know of the statements made before the Interstate Commerce Commission, and I presume you refer to that, they all speak about the laboring man. He was the fellow they were all after, and the great heads of the corporations and the great other things in the proposition seemed to escape them. They all seemed to think that to get down into the shop where the workingman was that there was where the great economy could be accomplished. That may be true, in a sense. I was in a shop only a few days ago in New York City where there were 27 workmen and 32 bosses. The man was having trouble with his men, and he asked me to come there to settle it, and I did settle it. I advised him to discharge three-fourths of his bosses, which he did, and the shop is now running all right.

(The committee thereupon adjourned until Monday, May 1, 1911, at 10 o'clock a. m.)

COMMITTEE ON LABOR,
HOUSE OF REPRESENTATIVES,
Monday, May 1, 1911.

The committee this day met, Hon. William D. Wilson (chairman) presiding.

The CHAIRMAN. We have not very much time this morning, as the House meets at 11 o'clock. Mr. Stimpson desires to be heard on the resolution.

STATEMENT OF MR. HERBERT F. STIMPSON, OF NEW YORK CITY.

Mr. STIMPSON. Mr. Chairman and gentlemen of the committee, I may begin by saying that I want to very heartily support this resolution.

Mr. VREELAND. Tell us whom you represent, if anybody?

Mr. STIMPSON. As far as representation goes, I am chief engineer of the Universal Audit Co., of New York. That company renders complete commercial service, of which the efficiency engineering, similar to that comprehended, more or less, under the Taylor system, is only a part. It believes that the development of the business as a whole is the essential thing, and not the ultradevelopment of any section of it. In other words, the production end is only one part of it. There are the sales end, the financial end, and other ends.

I may say that in this case I am speaking from the standpoint of a man whose father was an apprenticed workman in the sheet-metal trade, and that I am not a college man. I suppose Mr. O'Connell would call me, to a certain extent, a lead-pencil faddist; but I do not think that I am exactly that. I have had nearly 30 years' experience as an engineer, a great deal of it in connection with large manufacturing companies like the General Electric Co., but I have been out of the direct production line and have been in the line of planning the plants and arranging the processes, and therefore, perhaps, I have as unprejudiced a point of view as a man possibly could have and be near the work at all. Then I have had direct charge, at times, of a considerable number of men engaged in constructive operations.

It is not for me to write a brief for Mr. Taylor; I have never had the pleasure of meeting the gentleman, although I have known something of his work, and it interests me. I have come up through the stages of studying the planning of a building and then of the apparatus which went into the building, why it went into the building, why it was arranged as it was, and then the management of the business operations, and I found that the latter was by far the more interesting part of the whole. I was associated for a year with Mr. Harrington Emerson, who appeared before the Interstate Commerce Commission at the time Mr. Brandeis did, and I got more light on the subject then than I had ever had before. I subsequently found that it was necessary to consider something more than the study of the man and the machine; that unless the other departments of the business were properly correlated it was like riding in a wagon with one big wheel and three little wheels.

The gentlemen who have spoken previously have studied the subject at pretty long range. In my actual experience I have been pretty close to it, but before I get to that I want to speak on the ques-

tion of standards. These gentlemen are, and I think with reason, apprehensive of the establishment of standards entirely by the employer. I am equally apprehensive of a standard determined upon entirely by the employee. I do not think either direct party should establish the standards. The thing I want to draw to your attention, therefore, is a wider view of this proposition than has yet been brought out, and the fact that because the standards which Mr. Taylor may seem to be adopting may be open to question, you can not reason from that that an absence of standards is a desirable condition. In my experience as an efficiency engineer I have come to see that what I need more than anything else are standards from which I may make proper determinations in the apportionment of tasks to workers of every sort. I think the interests of both organized labor and capital and, still more, the interests of the consumer—to which class everybody belongs—would be tremendously conserved by the determination of a standard by which labor could be measured. Now, let me explain what I mean by that——

Mr. SMITH. Do you not think the capacity of a man will determine the standard? Do you think there could be a standard by which all laborers could be gauged?

Mr. STIMPSON. That is what I am going to explain. Now, if you take a machine and put into it a piece of raw material, it is possible for a mechanical engineer to determine the resistance which that raw material will oppose to the operation of the machine. You set up your work, you start your machine, and the material develops a certain amount of resistance to its operation. You can trace that back through the different parts of the machine and you can determine the mechanical energy which is necessary to overcome this resistance and to drive the machine. Energy is measured, speaking from an engineering standpoint, by what we call a compound unit; this is composed of distance, time, and resistance. That is a perfectly sound principle of engineering, and by the application of that principle you determine the power you need to drive the machine—that is, on the mechanical side. On the other side you have a certain amount of energy which is applied by a man in the control of the machine. Take your locomotive engineer; he applies his physical force to the control of the locomotive, but the power which moves the locomotive is generated from the coal. The amount of energy which we utilize we can also determine. If we drive a machine electrically, we can determine as to the motor, the wires, the generator, the engine, and boiler and, finally, the amount of coal that is necessary to generate power enough to move that machine. Now, go back the other way; you have a man applying his hands to the control of the inorganic machine. The man's body is a machine—and I say it respectfully. You have his mind as a motor energizing that machine; you have the mental energy coming to his mind through the foreman, assistant foreman, assistant superintendent, superintendent, general manager, vice president, president, executive committee, directors, and stockholders.

Now, it is known, and it is on record in Kent, and other engineering handbooks, that a man's capacity to generate energy is about one-tenth the power of a horse.

Mr. LEWIS. That does not measure his endurance?

Mr. STIMPSON. Yes; it does.

Mr. LEWIS. It does?

Mr. STIMPSON. I mean his day-to-day capacity, not his capacity in a spurt; I mean his day-to-day capacity on the theory of nonexhaustion. As I said, the capacity to generate energy in the average man is about one-tenth the power of an average horse. Now, I can figure back and I can determine how much horsepower I want to drive my plant, and I can bargain for it. For instance, in New York the Edison Co. will sell me so many horsepower hours. Is that expression clear to everybody? That is the power of a horse for one hour. It may be clearer to say a kilowatt hour, which is a little more, just as a meter is more than a yard. I can buy a horsepower hour from the Edison Co. for 2 cents, which will do anything I want; I can move anything I want with it. If I get the same amount of energy from a man who is paid 20 cents an hour, the same amount of energy would cost me $2. Therefore the human physical force is 100 times as expensive as the electrical or mechanical physical force. It is perfectly easy for me to determine how big motors, wires, generators, engines, and boilers I need in order to generate any desired amount of mechanical energy, because I know something about the strength of materials, hence I can design machines which will give me any energy I want. What I only have a comparatively slight knowledge of is the power-generating capacity of the normal man, and that, as an engineer, is just what I want and I want it badly, because I am up against this especial problem. An employer asks me, "How much can my men do?" While I can make certain approximations, I do not find as much data as I want. I am at present engaged in an effort to find the line of action which is necessary to cause that standard to be determined.

Mr. LEWIS. What occupations have you investigated in an effort to find out?

Mr. STIMPSON. Metal work and the handling of bulk commodities, a certain amount of textile work, and a number of others.

Mr. BUCHANAN. What branches of the metal work?

Mr. STIMPSON. The fabrication of structural steel.

Mr. LEWIS. Have you ever investigated coal mining?

Mr. STIMPSON. No, sir; but the utilization of energy is absolutely independent of the particular line of business. For instance, if you were running a steam engine, you do not care whether that engine is pumping water out of a mine or driving an automobile, except as you vary your types and sizes of engine. The basic problems are no different. A man is a portable power plant, speaking mechanically. He has a boiler down here, the stomach, where he consumes his food. If the man is not supplied with food, he varies from a boiler in this respect—that a boiler, barring consumption by rust, will continue to exist; but if a man does not get fuel, he does not continue to exist; he will starve and die. The processes in the stomach are not dissimilar to burning coal in the grate. He has an engine in here, his heart, which is a pump. If I want to lift my arm, I pump blood through valves controlled by nerves into a muscle; that dilates the fibers of the muscle, shortens it, and my arm comes up; it is a perfectly mechanical proposition.

But man generates another kind of force, which is the mental force, and it is an entirely distinct and separate entity from the physical force. Transmission between mind and mind is akin to the

transmission of messages by wireless telegraphy; you do not see anything going through the air, but something does go because the other instrument operates. Anyone who has had the duty of directing workers knows that when you throw yourself into the job and force your mind to act on their minds, and when, through their minds, you control the machines of their hands, you are just about as tired at the end of the day's work, if you have devoted yourself to your task, as you would be if you had pushed the tool. Therefore, mental energy has a certain physical character which we do not yet know much about, and therefore we need an investigation into the mental energy-producing power of man as well. The curious thing about it is that whereas the mental energy-producing ability is the distinguishing characteristic of man as differentiated from the animal, we know the least about it.

Now, on the assumption that a man can generate about one-tenth the power of a horse——

The CHAIRMAN. That would also differentiate the human machine from all other kinds of machines?

Mr. STIMPSON. It does. But the physical part of the human machine is not unlike the physical part of any other machine. But you have another quality in it, and if you try to study both of those qualities simultaneously you get balled up. It is only when you analyze and set apart the things which belong to one kind of energy from the things that belong to the other kind of energy that you are able to clearly grasp the characteristics of each of them.

At present the friction between capital and labor, in my opinion, is due to the fact that neither side has a definite unit for measuring what it is buying or selling. So far as the physical part goes the workman thinks the unit ought to be one thing and the employer thinks it ought to be another. In both cases, with all due respect to the gentlemen on both sides of the question, they are simply guessing at it.

Let me tell you of one or two things which have come under my observation. In a foundry in Manhattan, where a man was working at the job of making molds in a molding machine—and if I use any technical term that is not clear, I trust the gentlemen will ask me to explain—the man was observed during eight repetitions of the operation. He was under normal conditions, he was not under pressure; he was working by the day, and he did not know he was observed; therefore he did exactly what he had been in the habit of doing. He repeated that operation eight times, but varied in time from 5.2 minutes to 23.6 minutes per operation; his elapsed time was 104 minutes. If he had made 8 molds in 5.2 minutes his ——

The CHAIRMAN. What do you mean by elapsed time?

Mr. STIMPSON. I mean that the total time of all the 8 operations was 104 minutes.

The CHAIRMAN. I did not know but what it might have been the time between the operations?

Mr. STIMPSON. No; it was the inclusive time for the whole eight operations. If the man had performed each of the operations in 5.2 minutes, he could have gotten through in 41.6 minutes, or about 42 minutes. He did the work in 5.2 minutes without any urging, without any pressure at all, and, therefore, reasoning by analogy, he spent 62 minutes longer in doing that job than he need to have done. Now,

because the time that went into the office was the elapsed time, the total time, they reasoned that the unit time was one-eighth of 104 minutes, or 13 minutes, and they would make future estimates of cost on that basis. I do not suppose the man thought very much about it; there was no incentive for him to hurry the work, because if he satisfied his immediate foreman he got just as much money.

Mr. PEPPER. You say he could have done it in 5.2 minutes. Would you consider any element of physical weariness and rest, any connection between the two, as being essential to his welfare?

Mr. STIMPSON. I would. But when a man was working under those loose conditions I consider he was going at a gait that was entirely within his powers. The 23.6 minutes, those longer times, were due to the fact that he went away from his work for various reasons or he talked with other men; but nevertheless his employer was paying him for that time. But, as I say, he had no incentive to give attention to the time; if he satisfied his foreman that was all that was necessary; I do not blame the man and have no criticism of him to make at all. But you can see that because of these conditions somebody has to pay for the wasted time, and perhaps the man himself was one of the somebodies.

When I go in to set a standard time for work I desire to set a time which is amply within the resources of the ability of the man. I want to explain what I mean by that. In structural work we know and we have determined by experiments in different grades of material that certain kinds will ultimately break at a certain strain per square inch. The average ultimate strength of high-carbon steel, the strain at which it will tear apart, is about 80,000 pounds; some pieces run as low as 78,000 and as high as 83,000 or 84,000, but the average is about 80,000.

Mr. BUCHANAN. That is the breaking strain?

Mr. STIMPSON. Yes. We know that if we stress that steel up to half of that we reach what is known as the elastic limit. Whenever you put a strain on the steel it stretches it. just as you stretch a rubber band if you have any tension on it, but if you do not stretch it over the elastic limit it goes back again and it is not permanently weakened or elongated.

The CHAIRMAN. If you put that elastic strain on your material, at frequent intervals, will it not ultimately result in destroying the elasticity of it?

Mr. STIMPSON. Not if you do not exceed the elastic limit.

Now, let me explain that. What I am talking about is the direct pull and not the bending action. When you put a bar under a bending stress, you set up a strain which bears hardest on the lowest fibers; these are the most strained, and therefore we are careful not to strain our material over half its elastic limit.

Mr. BUCHANAN. What do you consider the elastic limit?

Mr. STIMPSON. We have determined by experiments that it is about half the ultimate.

Mr. BUCHANAN. Half of the breaking strain?

Mr. STIMPSON. Yes. So we do not put a working strain on any portion of the material of over half the elastic limit, because we can not do that without producing appreciable deterioration in the material. Now, I think, and I am perfectly willing to say so, that the tendency in discussions of the tasks for workers has been to set

that standard too near the ultimate point. I do not think it is right; I think that at least the same consideration should be given to the man which would be given to a steel bar. But until we determine what the facts are we can not tell whether we are going up near the ultimate strain or whether we are away down below.

Mr. LEWIS. Reference has been made to the work of a carrier of pig iron being increased from 14 tons to 49. What do you think of that?

Mr. STIMPSON. I am absolutely unable to determine whether the 14 tons or the 49 tons were right; I do not know; I would like to know. I do not believe the 14 tons, speaking roughly, were a reasonable day's work. Whether the 49 tons were away up near the breaking point I do not know; I never saw the man; I never happened to investigate that problem. But I do know this, that I have recently made some investigations of carrying or moving large bulks of commodities. I want to say before I go any further that the rules of my company prohibit me from mentioning the name of the client; I am sworn not to do it. I separated the operations into factors—that is, if a man was to take up something from that pile and put it on this table [indicating] he would do two things; he would carry it a certain horizontal distance and he would raise it a certain height, and I had to separate it into these two elements in order to draw a deduction. Now, taking the data which I have been able to get, and which was found by observations of what men had done, I so separated that work, and I found in 31 operations, taking the elapsed time—that is, the time it took the men to go to a certain place and handle one lot of packages and then to another place and handle another lot—that the average efficiency was not over 27 per cent; that was because the men stopped for various purposes and did not work, sometimes having to wait for trucks and other things, and when we took the time in which they were actually engaged in work, their efficiency was not over 50 per cent.

Mr. PEPPER. What did you use as a basis in order to get the percentage?

Mr. STIMPSON. I used the data contained in William Kent's Mechanical Engineers' Handbook, which is an accepted engineering authority. I think you will find it on page 509, but I will not swear to the page. Now, I will tell you of another instance.

Mr. VREELAND. Does that book establish a standard of human energy for a day's work and an hour's work?

Mr. STIMPSON. It gives the performances of men in doing various kinds of work, such as lifting, turning a winch, etc. Now, in a certain rivet operation, which I once had to do with, one boy heats the rivets in the furnace and throws them over to another man, who takes up a rivet with tongs and sticks it into the hole; another man takes a bar of steel, about 2 feet long, called the "dolly," and holds it up against the formed head of the rivet; another man takes a pneumatic hammer, which is operated by compressed air, and with it forms the new head. Now, I found that the men, at that time, were driving 600 rivets per day, and it was known that that was way below normal.

Mr. BUCHANAN. What size of rivets?

Mr. STIMPSON. Three-quarter inch.

Mf. BUCHANAN. And that was in the shop, was it not?

Mr. STIMPSON. Just outside of the shop.

Mr. BUCHANAN. It was done in the work of assembling, was it not?

Mr. STIMPSON. Yes; it was not out in the field, it was on a platform just outside of the shop. Now, by observing what those men did, I found that they repeatedly moved themselves in a way that was not necessary, and that by so doing they used up their energy, and, also, that they unnecessarily handled heavy tools. For instance, the men went down the line of rivets from left to right; the open holes were behind the forearm of the man holding the dolly as he packed up the rivets, and the man who picked up and placed the rivets could not put a rivet into the next hole until the man with the dolly moved, because this man was in the way. I suggested that they turn around and go the other way, that the man with the dolly should protect his arm with a leather shield so he would not burn himself with the hot rivets, and in that way the open hole would always be accessible to the man placing the rivets. The man was working in a cramped position, and it was a considerable effort, taking much strength and time, to move himself out of the way for this other man to put the rivet in, and when they went the other way he did not have to do it.

Mr. BUCHANAN. How many hours were occupied in putting in 600 rivets?

Mr. STIMPSON. Ten hours, I think.

Mr. BUCHANAN. You do not remember the hours?

Mr. STIMPSON. Yes, I am very positive it was 10 hours; it might have been 9¾ hours, or something like that. Then I found that after the man had driven a rivet or two there would be something the matter with the hole and they could not get the rivet in; they would then lay down this heavy hammer, take up a heavier tool, called a reamer, ream the hole, lay down the reamer, take up the hammer again and drive the rivet. I said to them, "Drive one rivet, lay down your hammer, pick up your reamer once and ream or try all the holes, lay it down once, and in that way overcome 90 per cent of the energy required to lift that heavy reamer. Then I told them to take up their hammer and drive all the rivets in a seam; then to straighten up, get the kinks out of their backs, rest two minutes, and then drive the rivets in another seam. In three or four days we set a higher standard. These standards are not always as severe as has been thought. We set a standard of 1,200 rivets; we gave a man 20 per cent bonus for coming up to the 1,200 standard, and we offered them 1 per cent more bonus for each per cent of efficiency beyond the standard; we left that to the men, and they, of their own volition, drove between 1,500 and 1,600 rivets, and there was no pressure brought to bear on them whatever, except that there was a bonus, and if they wanted it they might have it; and they did it easily, because they used to better advantage the strength which they had previously used in unnecessarily handling the tools.

Mr. BUCHANAN. Were these 1,600 rivets on the same character of work?

Mr. STIMPSON. Exactly; it was the same work, done by the same men, with the same tools, in the same place.

Mr. BUCHANAN. Was it what you would call buckle-plate girder work?

Mr. STIMPSON. No; it was some big square sheet hoppers, 5 or 6 feet deep, about a foot square at the bottom, and about 6 feet square at the top.

Mr. BUCHANAN. It was exactly the same work?

Mr. STIMPSON. Yes, sir.

Mr. HENSLEY. Is the labor you speak of, which was performed under your system, performed under the Taylor system?

Mr. STIMPSON. The gentlemen who know more about the Taylor system must answer that. I have never been in a shop where the Taylor system was used, and all I know about the Taylor system is what I have read, and I do not talk about another man's work.

Mr. BUCHANAN. As I understand you, Mr. Stimpson, you maintain, then, that there were 1,600 rivets driven by the same gang of men with no extra effort?

Mr. STIMPSON. Yes.

Mr. BUCHANAN. Just turned out that much work with no more effort than when they drove 600 rivets?

Mr. STIMSON. Well, now, I will not say that exactly, because when they were driving 600 rivets they were not working continuously, and they had no reason to do so; if they did not get censured by the foreman it was not to their advantage to work any harder than was necessary to escape censure. When we gave them a reward for industry they were found to be willing to put forth their full efforts, but I do not mean that they worked at a ruinous pace.

Mr. LEWIS. You have determined upon a unit for a normal man, namely, one-tenth of a horse, but, of course, that is purely a mechanical proposition. Now, will you give the committee the benefit of your judgment on this question, as to whether, with a view to the physiological value of the man when working at a normal rate of exertion, 8 hours or 10 would be the better for him?

Mr. STIMPSON. I say four. I do not like Mr. Gompers, because he wants to make people work eight hours.

Mr. BUCHANAN. You say four hours are enough?

Mr. STIMPSON. Enough. And, gentlemen, my experience is that these long hours are almost entirely due to this waste of energy and waste of time.

Mr. LEWIS. How many hours should a man work, in order to be able, with some pleasure in his work, to repeat his performance indefinitely from day to day?

Mr. STIMPSON. Well, will you allow me to answer that in a roundabout way?

Mr. LEWIS. Yes; in your own way.

Mr. STIMPSON. I can not answer your question directly. A man's mechanism has this peculiar characteristic, that a man has in his nervous system something which corresponds to an accumulator or storage battery which carries him over peak loads.

Mr. LEWIS. What do you mean by that?

Mr. STIMPSON. Well, on your electric railway systems, in the mornings, when everybody is coming down town at once, and at night, when they are going home, you have a peak load. Do I make myself clear?

Mr. LEWIS. Yes.

The CHAIRMAN. The highest point of the load?

Mr. STIMPSON. Yes. In other words, it provides for a high rate of energy for the time being, because you must bear in mind, gentlemen, that you have always got time and distance in these things, as well as resistance. Now, suppose you have a barrel full of water and you have water running into it through an inch pipe; you begin to dip out of that barrel with a big cup or take out the water through a lot of little pipes. If you do not take the water out any faster than it runs in through the inch pipe, your water level in the barrel will not vary. If you draw the water out faster than it comes in, sooner or later that water level will sink, although the stream is running in all the time, and you will get to the point where you can not dip any more out. Now that barrel represents my idea of a man's capacity as an accumulator. His energy is generated at a certain rate, and it does not make any difference, in one sense of the word, whether the day's work is 8 hours or 10 hours, but you must not take energy out of him any faster than his system is generating it, or sooner or later you will exhaust his capacity and the man will collapse. Does that answer the question to your mind?

Mr. LEWIS. It supplies one of the conditions.

Mr. STIMPSON. You see it is not a simple proposition; it is a complicated proposition.

Mr. LEWIS. As a practical thing, do you think the inauguration of standards that would definitely make certain what each man was doing, thereby cutting out the soldiering, would necessarily give us an eight-hour day?

Mr. STIMPSON. I think it would give you a four-hour day; I have not any more question of it than I have that I see you.

Mr. VREELAND. Is not that a rather extreme view?

Mr. STIMPSON. No. It has been so held by men who have investigated this thing for a good many years, and if it were not for the views of those men and my own observation I would not speak so confidently.

Mr. BUCHANAN. I suppose you mean by that that in 4 hours you could get as good results as you now get in 8 or 10 hours; but would that satisfy the employers? Would they not still require a workman to work as many hours as they could get out of him?

Mr. STIMPSON. I will answer that in this way: If you take, as you might say, a census of our people as a whole, and, gentlemen, the people that I am talking for are the people as a whole—the consumers—I am only talking for the capitalist and the laborer as they are a part of the whole; if you take a census of the people of this country as a whole and the things which they want (you will find that one man wants a horse and another wants an automobile, and that people do not like the same kind of clothes), you can determine the energy necessary to produce those things. If, then, you determine the energy-producing power of the individual and multiply it by the number of available workers, excluding the aged and the children, you can determine the length of the working day by dividing the available units of energy into the amount of energy required. If you have to spend $100,000 and have 100,000 men, that means a dollar apiece, but if you only have 50,000 men they have got to give $2 apiece. The amount of energy which each

individual would have to contribute per day could be determined in a similar manner.

Mr. PEPPER. If the number of workers grew sufficiently small, you would have to have a working day of 16 hours in order to supply the wants?

Mr. STIMPSON. Yes; if those conditions obtained, but those conditions will never obtain. At the present time you have a tremendous army of unemployed.

Mr. BUCHANAN. I am a structural-iron worker by trade, and your views have been very interesting and, I believe, profitable to me. I want you to answer this question: Have you taken into consideration the lost effort on the part of men due to wrong directions on the part of the people who have charge of the work—have you studied that feature of it?

Mr. STIMPSON. I have studied it more than anything else.

Mr. BUCHANAN. It has been my experience that companies have foremen to direct the men who are not competent, and the men under them know more than they do.

Mr. STIMPSON. This is a wrong condition.

Mr. BUCHANAN. And yet if those men, who might know more, should venture to suggest or advise the foreman he would become offended and it would probably result in a discharge?

Mr. STIMPSON. Yes.

Mr. BUCHANAN. I have seen conditions of that kind.

Mr. STIMPSON. So have I.

Mr. BUCHANAN. I have quit jobs on account of wrong directions as to the work; you have to take all of those things into consideration and I want you to explain your experience in regard to that.

Mr. STIMPSON. I will see that each member of the committee gets a copy of these articles which I have published in the Iron Age for the last three months, the title of which is "Business Administration as a Constructive Science."

Mr. BUCHANAN. I want to make myself plain. I claim that lack of interest in the work is often due to the fact that the work is not properly directed.

Mr. STIMPSON. You are absolutely right. For that reason my company makes this point, that we begin with the chief executive; we say that if the chief executive selects the proper subordinates all the way down that then the men will receive the instructions which they ought to have, and, furthermore, all obstacles will be taken out of their way. And I have also stated to a great many executives, and that is why I do not hesitate to say it here, that 75 per cent of the inefficiency in manufacturing operations is not due to the men at all, but it is due to the fact that there is no correct understanding of the amount of energy which the men can generate, there is not sufficient care taken to prevent their wasting it, and that is the most interesting phase of the whole situation.

Mr. LEWIS. Do you know whether any of the plants that are interested in the application of this scientific management proposition have determined as a policy that when the highest efficiency is secured they will so reduce the hours of labor as to afford an opportunity for men who might be out of employment, and thus harmonize the demand for workers with the supply?

Mr. STIMPSON. I do not think that has been done for the reason that nearly all the efficiency work has been confined to the consideration of the productive department of the business alone, and it is for that reason that I have associated myself with a company that considers the other departments.

Mr. LEWIS. So far as the thing has proceeded it has been purely a mechanical question of output?

Mr. STIMPSON. Very largely.

Mr. SMITH. Are you an employer of labor—do you manage men?

Mr. STIMPSON. I am chief engineer of the Universal Audit Co., which advises as to the management of men and also as to the management of the business as a whole.

Mr. SMITH. Did you ever recommend that your factory run four hours a day?

Mr. STIMPSON. No.

Mr. SMITH. Do you know of that being done?

Mr. STIMPSON. No, sir; we are not ready for it as yet.

Mr. VREELAND. You have not furnished us any theory upon which work could be done in four hours a day, because you are leaving out the element of machinery. You take the railroads; the railroads to-day, we will say, are performing the transportation of the country. Now, what part in total energy expended does man take? A very small percentage of it. A reduction in hours from eight to four a day supposes the reduction of energy by machinery?

Mr. STIMPSON. No, sir; because——

Mr. VREELAND. The engines keep right on running?

Mr. STIMPSON. Because you can run an engine 24 hours a day by runing six shifts of men. The engine requires so much human energy for its operation, but it does not all have to come from one man per day.

Mr. VREELAND. As I have said, you have not furnished, so far, a theory upon which this could be done.

Mr. STIMPSON. That is what I meant. You first have to determine the amount of mechanical energy, and then the amount of human energy to control that. I am now speaking of the human energy, the energy which a man furnishes, and he must furnish energy to control the machinery, and the more machinery we have the better——

Mr. BUCHANAN. I do not want to get away from this other question, the question I first asked you. You say you have investigated it from the point of view of the wrong direction by foremen. Have you investigated from the point of view as to how much loss there is due to workmen knowing they are doing an extra amount of work for nothing and becoming disgusted with that method of doing work? In other words, that they get tired and annoyed and do not have the same interest in the work as they would have if they were moving to accomplish what they desired?

Mr. STIMPSON. I have never taken it up on just exactly that line, because it did not come to me that way. But what you say is perfectly true; I have been in that fix myself and know what you mean.

Mr. BUCHANAN. So have I.

Mr. STIMPSON. But I have investigated this theory: I found in a plant in Connecticut, where I investigated 213 operations, that only

14 per cent was performed as the result of specific directions and that only 33 per cent was made the subject of specific, intelligent reports, so I said to the president, "If you are only directing 13 per cent of your operations and you are only getting reports from 33 per cent, I do not see where your administration comes in." The work which we did for him was to show him how to create a human machine which would take the concentrated information that came from the sales department and transmit it properly through his factory so his men would know what was wanted of them.

Mr. HENSLEY. What is your attitude, now, toward this resolution?

Mr. STIMPSON. Absolutely favorable (I see the time is nearly up; we could talk on this thing at great length; I can not condense the experience of five or six years in a half hour), but I hope the gentlemen will see to it that they do not stop at investigating the Taylor system, which is only one little bit of detail, but investigate the whole subject of industrial efficiency. This whole problem is a great big one, and you can be of great service to organized labor by working out something that will take in every part of the subject; you have an opportunity to do a big, elegant piece of constructive work by taking some action, if it is possible, which will work out the theory that I have only outlined to you, the determination of correct standards for the protection of both capital and labor, and hence the protection of the people as a whole in such a way that they can be easily applied to everyday business.

Mr. GRAY. You say you have no connection with this Taylor system?

Mr. STIMPSON. No, sir.

Mr. GRAY. May I ask you what special interest you have in this present hearing?

Mr. STIMPSON. My interest in the proposition as a whole is a matter of public spirit and because of my particular and specific knowledge of facts.

Mr. GRAY. At whose instance are you here before the committee?

Mr. STIMPSON. At my own instance, with the approval of my company. We are doing a certain amount of research work at the same time, and we know that it is profitable for our clients. We have no other interest whatever.

The CHAIRMAN. May I ask if you have given any attention to the effect on the human frame of the subdivision of labor as related to the well-known fact, at least well known to those who have performed physical labor themselves, that a change of work is often a rest? What I have in mind is this: The subdivision of labor frequently compels men in the particular subdivision in which they are engaged, to apply the same muscles continuously during their entire day of employment, and whether or not there might not be an increase in the general efficiency, if not in the efficiency of the one man, if the subdivisions of labor were such that there might be a change of the labor during the working-day, so that different muscles would be in play at different periods?

Mr. STIMPSON. I can answer that question from my own experience. For a great many years I was actively employed in building and structural work, and when I went into this employment it kept me tied down to my desk; it was brain work and not body work, and my health began to deteriorate. While I found it necessary to stick to my desk during office hours in order to do my work, I had

to get a change and relaxation out of office hours, and my doctor suggested to me to ride horseback, which has done the trick. In order, however, to be of value to my company I must stick to my last while I am making shoes. If you can reduce the hours of labor, the man who is engaged in making shoes then has an opportunity to make the change you speak of, not in another kind of work, but in play. I would rather do it that way myself. The other change would disorganize industrial conditions to a mutual disadvantage.

The CHAIRMAN. If I were to use a pick for eight hours continuously, I could not accomplish the full amount of work which I could accomplish in eight hours' working with a pick if there was a rest between?

Mr. STIMPSON. Yes, sir; that is true.

The CHAIRMAN. If I were to work for an hour or two with a pick and then I should have a half hour with a drill and an hour with a shovel and a half hour with a sledge hammer and then should go back again to the pick, my efficiency for the next hour or so with the pick would be greater than it would be during that same period of the day if I had kept on continuously with the pick. What I wanted to find out was whether or not you had given any attention as to the effect of the subdivision of labor upon workmen in that way?

Mr. STIMPSON. That is more a physiological question, but your theory is perfectly sound, in my judgment, because you are paralleling the rotation of crops by the farmer, and I can not see any objection to taking men in a gang and rotating them so that if you have four operations each performs all of the four consecutively. I think it would be good. I do not see any objection to it. In some places I think it is sometimes done in a rough way.

The CHAIRMAN. The time has come when we must adjourn. I would like to inquire if you have brought out all you desire or if you would like to come before the committee again?

Mr. VREELAND. I would suggest that we can give the gentleman permission to extend his remarks before the committee, if he desires to do so, and it can be printed in the hearing.

Mr. STIMPSON. I thank you.

Mr. LEWIS. Please answer this question in doing so [handing Mr. Stimpson question].

Mr. STIMPSON. Yes, sir. I have given to your chairman a couple of articles which may be of interest to the committee. The only thing I want to ask of the committee is that you do not simply turn this investigation into a little bit of an investigation of the Taylor system, but take it up from every point of view, and, if possible, enlarge the scope and determine the whole proposition of industrial efficiency, and make a great big elegant constructive piece of work. There are a great many good things about Mr. Taylor's system, but I think that the Government is the only one which can determine the standard independently and scientifically. I do not think it should be left to either side. I thank you very much.

Mr. LEWIS. If we should attempt to get the testimony of the workmen under this system, would their jobs be perfectly safe?

Mr. STIMPSON. You would have to ask the employers. I should think they would be, but you know perfectly well what the attitude is where men have been called on for military service. I will say this; I have found nearly as much opposition, in talking with a

great many firms, among the employers, as among the men, and I will also make this statement, that it is due to exactly the same cause, that human nature does not like to be taught.

Mr. LEWIS. There is no doubt about that.

Mr. STIMPSON. The boot leg is just as long on one leg as on the other, and I have had just as difficult arguments with the one side as with the other, so I am strictly impartial.

(Thereupon the committee adjourned.)

Question by Mr. LEWIS (submitted in writing). What is the effect upon an individual workman who has been trained to an intense degree as a specialist and who has been deprived of an opportunity to perform more than one operation?

Answer by Mr. STIMPSON. If I understand the question correctly, I think such a case would be extremely exceptional. Take the case of any machine tool; the work itself would vary to a very large degree usually. Standard instructions would have to be completed for handling each kind of product. It is believed to be true, however, when a man accustomed to following closely clear, explicit directions undertakes work for which no such directions have been formulated, that he has acquired habits of swiftness and certainty in his physical movements and in his mental grasp of the conditions which cause him to perform this new work with much more advantage than a man who has been accustomed to the looser methods of his own personal devising.

In accordance with the suggestion of Mr. Vreeland that Mr. Stimpson be given permission to extend his remarks in writing, the same to be included in the printed report of the hearing, the following articles written by Mr. Stimpson were presented:

(1) "Business administration as a constructive science." (Reprinted from the Iron Age, New York, of Jan. 26, 1911.)

(2) "Business administration as a constructive science." (Reprinted, with an editorial, from the Iron Age, New York, of Mar. 16, 1911.)

(3) "Business administration as a constructive science." (Reprinted from the Iron Age, New York, of Mar. 23, 1911.)

(4) "The economics of efficiency." (Manuscript.)

(5) "The instability of money." (Manuscript.)

BUSINESS ADMINISTRATION AS A CONSTRUCTIVE SCIENCE—OPERATIVE METHODS WELL DEVELOPED, BUT DIRECTIVE METHODS STILL LACK MUCH—THE USE OF STANDARDS AND RECORDS.

[By H. F. Stimpson, chief engineer, Universal Audit Co., Singer Building, New York. Reprinted from the Iron Age, Jan. 26, 1911.]

The object of civilization, physically speaking, is to provide the individual with a sufficient quantity of such of its products as he may desire. Let us see why this is not done.

We have an abundance of raw material or of productive soil; our mines are not exhausted, nor is our soil cultivated to the ultimate degree of possibility. We have an abundance of equipment; the trade journals tell us that the tool manufacturers are not as busy as they might be.

We have an abundance of labor or the material from which it can be developed. There are always many persons who desire to work, yet who find no opportunity for doing so. There are many others who are physically capable of working, but who do not desire to work. Many of these are supported by the worker in some form of restrictive institution. These same workers, curi-

ously, seem to prefer to support these people at the cost of added effort on their own part rather than to allow those so supported to earn their own living.

We have no lack of skilled methods for the operation of equipment upon the material. These have been supplied to us in abundance as the result of study and experiment, both by direct workers and, later, after being formulated, by our technical schools.

TRAINED ADMINISTRATORS LACKING.

Where then is the lack? I assert that it is in the supply of trained administrators in sufficient quantity to combine all of the material, equipment, and labor which are necessary for the production of the amount of the things which we need.

The reasons for this shortage are: First, in contradiction to the plain teachings of our experience in every other line, we hold to the absurd doctrine that a manager is born, but can not be trained; hence, second, our system of education provides for instruction in the management of things and not of men.

Management or administration is an exact and constructive science which can be as well formulated and taught, without reference to the business to which it is to be applied, as can the science of mechanics. We are beginning to see that scientific management will pay when applied directly to the worker at the bench. It is even more profitable when applied to every individual through whom the efforts of the worker at the bench are directed. This science is being formulated to-day by men who have been studying it for years. They are the only source from which immediate relief can be secured; but the professional educator should bestir himself in the remodeling of the present antiquated methods, so as to meet the new demand and in order that coming generations may receive the instruction which their forefathers were unable to procure.

STANDARDIZING AS LARGE CORPORATIONS WERE FORMED.

The business organization known as a corporation is as necessary and logical a resultant of the development of our civilization as are the uses of electricity. With the increase in the volume of ascertained fact it has been found impossible for any one man to acquire a sufficient knowledge of all the phases of a subject by personal contact therewith to draw entirely comprehensive conclusions regarding it. For this reason the collaboration of many individuals becomes necessary in the conduct of any business, and the ability to coordinate and direct the efforts of these individuals is as much a science as is the work of any one of them, and it is entirely distinct therefrom. The effort of this article will be to show that it is constructive in its character.

About 1899, when the loose federations of business firms known as trusts began to crystallize into giant corporations having complete ownership and operating from central points, it became apparent that while the ultimate power was being focused in fewer hands the resulting change in the organization, which became necessary in order to properly connect the executive with the worker, was one of kind rather than of quantity. Each of the unit businesses before these combinations took place had its individual methods and peculiarities, and so long as these affected itself only, no inconvenience resulted. Subsequently it became essential that all the units should adopt one single method of performing any common act. This involved a decision as to the merits of the different methods, and some sort of a standard became a necessary prerequisite to such a decision. Mere whim or personal opinion had to stand the fire of conflicting opinion, and there was a search for a basis of sound logic upon which to erect these standards.

POSSIBILITIES, NOT RECORDS, THE STANDARD OF EFFORT.

The determination of these standards, furthermore, necessitated a radical departure from previous habits of thought. This departure as yet has been completely made in only a few cases. The decisions necessary to the conduct of business up to that time had generally been based upon a reflective consideration of the historical records of accomplishments rather than upon a constructive consideration of future possibilities. Effort, while energetic, was then and is now largely directed toward the surpassing of previous achievements rather than toward the attainment of a definite result. It was not realized,

apparently, that many data which already existed as to the possibilities within our power were but very slightly utilized. Take the case of labor: The amount of "a fair day's work" has been the subject of endless discussion, when it is really a matter of comparatively simple, though rather voluminous, calculation. Frantic guesses were and are made both by employer and employee as to its amount, and many bitter battles have been fought in consequence. Yet a day's work for a normal man can be determined with mathematical exactness, and the variations due to individual characteristics can be equitably covered by a logical application of the piecework or the task and bonus systems.

DIRECTIVE METHODS.

In any body of men commonly engaged in organized effort the number and type of those directing the work has a direct relation to the volume and type of effort. A director needs to know, not all that the one directed already knows, but rather that which he does not know. Duplication of knowledge is highly uneconomical and is one of our material failings. This arises from the day of small things, when the master stood at the workman's elbow ready and able to take the tools and give him a direct and practical illustration of proper methods if it became necessary. This function is now performed by a demonstrator who is not even a foreman, but is purely an adviser. The higher processes of the directive function, whereby equipment and material are combined in the execution of received orders, are not now exercised directly as of old, but through the medium of a number of individuals which is, as has been said, in direct proportion to the volume and kind of the desired performance. The large employer of to-day has often allowed his direct knowledge of productive methods to diminish without correspondingly increasing his knowledge of directive methods and thereby has directly lowered the efficiency of his whole organization.

No one man in the space of life allotted to him for preparatory work can assimilate complete knowledge of all the functions of a business. Some one man in the organization must, however, carry all of the responsibility. From this combination of conditions arises the necessity for individuals termed "staff assistants," who advise the executor or administrator along their especial lines in the performance of his duties. The allocation of these men and the definition of their duties and responsibilities has also been a subject of much discussion. Yet here again it is possible to determine with almost absolute accuracy the number and character of these men and their relation to the other members of the organization.

THE PLACE OF COST ACCOUNTING.

Having secured and used competent assistance in the determination of reliable standards as a guide in the issuance of his direction, the administrator next needs accurate records of the resulting performances, from which by comparison with the predetermined standards, he can ascertain the efficiency or inefficiency of his practice. This is the true function of cost accounting and much misapprehension commonly exists in relation thereto. A record in itself is of but comparatively little value and can not become so without the corresponding standard. The initial records of operations must be, so far as possible, in prime or indivisible terms. Combinations can be made later. The methods used should be such as will completely convey the necessary information to every member of the organization from the top to the bottom, and in such shape that it shall correspond to the predetermined standards. The civil engineer traces the stresses set up in each member of a bridge or other framed structure by each pound of dead or live load on its way to the ground underlying the foundations. In like manner the trained accountant traces every bit of data in its course to the successive and ultimate persons interested thereto.

THE SCIENCE OF ADMINISTRATION APPLIED.

The reason which obtains in the conduct of any business for the collaboration of individuals of varying experience, as given at the opening of this article, applies with equal force to the conduct of the enterprise of advising business men in the application of the science of administration. The grasp of the problem must be complete in order to insure success. Piecemeal methods are exceedingly dangerous. It is perhaps a necessary phase of evolution in this line

that many persons, actuated by the highest motives, should have endeavored and are now endeavoring to remedy the various defects in our business methods, whose existence is becoming more and more apparent every day. They have attacked defects in sales methods, cost accounting, and shop engineering, and have produced results which were good so far as they went, but these efforts have failed to be as completely or as permanently useful as might have been the case had they been properly correlated and adjusted to each other. This result, as in any other line of work, and for the same reasons, can only be brought about by a properly designed organization embracing the necessary individual experience, operating under competent direction and, therefore, able to undertake the analysis of all details of administration, from the charter of the corporation, or its equivalent, to the shipping platform, and from one side of the business to the other. Such facilities are now at the disposal of business men who are willing to put personal prejudice and policies aside and get down to logical deductions based on ascertained facts. When this becomes the common practice and it is realized that administration is a science which can be as well formulated and taught, without regard to the business in which it is to be employed, as can the science of mechanics, our educational methods will be improved accordingly, the era of cut-and-dry methods will end, and the ensuing extravagant use of our resources will gradually pass into history.

[Reprinted from the Iron Age, Mar. 16, 1911.]

EFFICIENCY AND ITS BROADER APPLICATION.

The voluminous discussion of greater efficiency as the thing most needful in our industries to-day has dealt with it almost entirely as applied to production. The analysis of manual and machine operations, with a view to the elimination of superfluous motions by the workman and for the use of the machine in the most effective way, has been put forward as a chief feature of the new campaign. Much has been said also concerning functional foremanship as an essential to intensive production. The tendency has been to concentrate expert study upon the problems of the operating department, particularly on the devising of means of increasing the output of men and machines, with larger earnings to the workman for his cooperation in the plan.

It is pointed out in the article on another page, discussing "Business administration as a constructive science," that emphasis has been thus put upon the manufacturing department as the field of administrative effort, almost to the ignoring of the other highly important coordinate branches of industrial organization, as selling, purchasing, and financing. Management has been so often interpreted as the managing of men employed in the manufacturing processes that its far broader scope has been missed. Administration as the science of all the forms of power employed in business is found to be vastly more than finding ways of speeding up the human machine and every other form of power employed in turning out product.

Practical examples of the mistake of putting operating experience in the saddle will come readily to mind. The economies strained after in the production department are often minute. In steel manufacture they are frequently measured in cents per ton of product. Yet mistakes in cost finding, in the price at which product is sold, in the price paid for materials, or in credit improperly extended may often neutralize all that the best equipped manufacturing department has accomplished in lowering the unit of production cost. President Farrell, of the United States Steel Corporation, said in his paper at the New York meeting of the American Iron and Steel Institute last week:

"Without any desire to belittle the practical value and importance of effecting a saving in cost of producton, however small, it has always seemed particularly hard upon the men who have accomplished what may appear as an insignificant reduction of the previous month's costs of producing pig iron or ingots or wire rods, to have this saving in mill costs dissipated by the sales department 'quietly meeting the market' with a reduction of $1 or $2 per ton at the first sign of any cloud on the commercial horizon. Good salesmanship and sound business principles in the conduct of the selling of iron and steel are just as essential and vital to the prosperity and continued success of the industry as low costs and up-to-date machinery and manufacturing practice."

While Mr. Farrell's argument was intended to bear directly on the policy of cooperation in the selling departments of the large steel companies, it illustrates well how far the study of operating problems falls short of meeting the demands of successful business administration. It is probably true, so far as the steel industry is concerned, that what is commonly thought of as its engineering side—the field of economical production—has been more highly developed in the past 20 years than any other department. With all the boasted economies in administration, due to consolidation in the steel trade, it is a question if the selling side of the United States Steel Corporation, for example, with its duplication of organizations along product lines, does not offer opportunities for savings that have been missed in the strain to shade mill cost sheet figures.

What is here said of the steel industry is merely illustrative; in other form it may be applied to other industries. So much has been made of the wage issue in recent years that it is not surprising that the outlay for work done in the manufacture of product has been a special challenge to efficiency engineers. Works management and production systems, moreover, were lines of least resistance; the study to improve them did not involve the status of individuals "higher up." Naturally, the advance of the efficiency engineer upon the broader problems of administration, in which the organization of a business as a whole comes under review, will be much more difficult.

In a recent article in these columns[1] I endeavored to show that administration may be considered as an exact science, having its own peculiar formulæ, which can be applied to any line of business as well as the science of applied mechanics or that of arithmetic. The object of this article is to correct a somewhat common misapprehension as to the real purpose for which this science is employed.

Interviews with prominent men in many of the larger cities of the United States have furnished me with abundant evidence that the purpose of administration is commonly believed to be the direct control of physical force, either human, animal, or mechanical. This belief, however, does not seem to be warranted by the facts.

MENTAL FORCE AND PHYSICAL FORCE.

Man differs from an animal or a machine in that he possesses a mental force through which he can direct not only his own physical force and that of other men, together with that of animals and machines, but by which also he can control the mental force of other men and through them the physical forces which they may control or direct.

If such are the facts, it is even of more importance that we should understand the laws governing the control and direction of this mental force than the laws regarding physical force. That such are the facts may be inferred from the following:

1. Man is dependent on commodities for both existence and pleasure.
2. A commodity is material to which force has been applied with such results as to fit it for the use of man.
3. Force may be divided into two types: (*a*) Physical force, which is applied directly to the material and may be of either animal or mechanical origin; (*b*) mental force, by which the physical force of men, animals, or machines is either controlled or directed.
4. Mental force is a prerequisite to the intelligent use of physical force toward a given end.
5. Mental force is one of the peculiar possessions of man which distinguish him from animals.
6. The real value of a commodity among men is, then, proportionate to the amount of mental force, even more than to the amount of physical force, which has entered into its production. Real commerce, therefore, is to be found in the exchange of mental force far more than of physical force, or of the commodities produced by force, or even of money, which is not a force at all but a mere token of force.
7. Mental force is an inherent possession of man from birth, and is, therefore, his prime trading capital.

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[1] The Iron Age, Jan. 26, 1911, p. 248.

8. Education develops but does not create mental force.

It is easy enough to say that the force produced by falling water or that produced by animals working in a treadmill is due to the action of gravity and that the force produced by the utilization of steam is due to the liberation and transformation of the energy which the sun long since stored up in coal or other fuel. But how much do we really know about it after all? What we really know the most about is not the origin of the force but what it will do under given conditions. If, then, we consider mental force as of unknown origin and are content, for the present, with observing its effects under given conditions, may we not, by analogical reasoning, rob it of some of its mysteries and predict its behavior with somewhat reasonable certainty?

MEASUREMENT OF FORCE.

We have demonstrated above that mental force controls physical force, and we know that—

9. Physical force can be and now is measured by a compound unit composed of distance, weight, and time, commonly known as a horsepower.

10. The amount of physical force which a normal man can generate daily is now known with some degree of certainty and is expressed in units known as man power, having a definite relation to a horsepower.

11. It is therefore possible to determine the amount of physical force which a man can physically control as well as that which he can generate.

12. Either of these may be the measure of a "fair day's work" according to conditions.

13. Until the units by which mental force can be measured are discovered we may measure it by the units of physical force controlled or directed by the mental force.

14. It should be possible to determine, on this basis, the amount of a fair day's mental work.

APPORTIONMENT OF PHYSICAL FORCE.

Let us now consider the use of physical force. We already determine, with a fair degree of certainty, the amount of force which must be imparted to the machine by its individual motor, and we regulate the size and capacity of the feed wires, cables, generator, engine, throttle valve, and boilers accordingly. We also determine the amount of coal, according to its richness in thermal units, which will be necessary as being, humanly speaking, the prime source of the desired force. The knowledge by which we are enabled to do these things has been obtained by specialists through study and experiment, and they have placed their discoveries at the disposal of all mankind. By such means we are enabled to determine either the number of machines which a given amount of coal will operate or the amount of coal and other things which are necessary to the operation of a given number of machines.

The physical force of the human body is comparable to the force of an inert machine; and while we have some information on the subject it is not as definite or as extensive as it should or might be. Hence the frequent and bitter strife between capital and labor over the amount of a "fair day's work." It is true that certain experiments have shown that a man power is about one-tenth of a horsepower, but what we sorely need is an exhaustive investigation into the relation which should exist between the periods of rest and relaxation for differnet volumes of load, in order that they may be so adjusted in the predetermination of industrial operations that the maximum of work may be obtained without exceeding the elastic limit of the worker any more than in the case of inert machinery.

THE HIGH COST OF MAN POWER.

The reason why this investigation has been neglected, is, perhaps, our monumental failure to grasp the tremendous excess of the cost of human over mechanical physical force. The large electric power companies will quote prices per kilowatt hour of from 10 cents per kilowatt hour for as little as 200 kilowatt hours per month down to 6 cents per kilowatt hour for as much as 3,500 kilowatt hours per month. And I have known current to be bought for as little as 2 cents per kilowatt hour in very large quantities. If a man power, as has been stated by a recognized engineering authority, is about one-tenth of a horsepower, then, on the basis that a horsepower is seven-eighths of a

kilowatt, and that labor is paid 15 cents per hour, human physical force is from 16.5 to 82.5 times as expensive as electromotive force—the force in each case being purchased from the generator.

Consider the elaborate investigations which are made into questions of mechanical and electrical engineering; the money and effort put into educational institutions for the education of the young along these lines; the struggle to produce mechanical refinements and power-saving devices; the tests of coal and other fuels; the gauges for measuring the use of power—and then consider the great lack of consideration, along anything like parallel lines, of the economical use of human power, each unit of which costs so many more of our dear American dollars, which we are supposed to chase so madly.

THE WASTE OF SKILLED MAN POWER.

In our employment of "unskilled" labor—the man who sweeps the street or office, the porter in the store or terminal, the roustabout in the factory yard or on the wharf—we are madly extravagant, but even more so in the case of skilled abor, which costs several times as much. And the consumer pays the bill. Yet the efficiency engineer, who has discovered this waste and is able and ready to remedy it, is the scorn and the jest of the average manager from Maine to Frisco; and even the laborer, who is more to be excused, not understanding the matter correctly, does not always recognize him as the friend he really is to all men. The most efficient way to utilize the physical strength of man is to employ it in the control of machinery by which the work is actually performed, rather than in the actual manipulation of the tool itself. The locomotive engineer, through his valves and levers, controls a far greater amount of force than he can personally generate, and in such cases any lack of efficiency is all the more manifest and deplorable.

APPORTIONMENT OF MENTAL FORCE.

Passing now to the control of the mental force, let us compare the mind of the worker to the individual motor on the machine tool; the foremen to the feed wires; the superintendents to the feed cables; the managers and vice presidents to the generator and engine; the general manager to the engineer; the board of directors to the boilers, where the latent force of the stockholders, who in turn correspond to the coal, is collected and transformed. Is it not reasonable to take the ground that, in the transmission of this force, the same fundamental principles may be made applicable as in the handling of any other force? May we not measure the amount of mental force expended by the amount of physical force controlled, as in the case of the foremen; or the amount directed, as in the case of the higher official, who deals with subadministrators only? Must we not secure proper proportions between the administrators and the demands upon them, as well as proper connections between them through which this force may flow? Must we not determine proper standards for their performances and obtain proper records of the results which they produce? Must we not adequately insulate the lines over which this force is transmitted and guard against cross connections and short circuits, which tend to produce waste and confusion? And should we not also introduce intensifying forces at the proper points, even as oxygen is introduced into a flame with a blowpipe, in the shape of specialists who have special knowledge of certain subjects which can only be attained by long and special study? All these things would appear to be reasonable assumptions in the light of our experience with more tangible matters.

PRODUCTION ONLY ONE FIELD OF APPLICATION.

From both the previous article and the foregoing it may have been erroneously inferred that this conception of administration as the science of the control of power, both mental and physical, is of value in connection with only one certain department of a business variously designated as the producing, operating, or manufacturing department, and that the other departments—those concerned in selling, financing, etc.—are controlled along other lines.

This is one of two ideas which are tremendous stumbling blocks in the way of progress. In every line of effort it is the mental force of those who are behind the movement which not only energizes those at the head of the active operations, but is by them so transmitted and directed as to energize all whom they control or direct. This is the force that "gets things done." Money is not itself, as said above, any kind or type of force.

COORDINATE DIVISIONS OF BUSINESS.

The other idea which is a stumbling block is that one of the fundamental divisions of a business is superior to or inferior to another. Unless a logical and true balance is preserved among these the development of the business will be one-sided, resulting in maladministration. Many businesses are far less successful than they might be because the manager has gained his experience largely in one or two divisions and thus has been unable to acquire a comprehensive grasp of the business as a whole.

We need men who are trained chiefly in the fundamentals of administration and supplementarily in the details of all of the divisions. It is only because administration has not been and as yet is not generally recognized as a science in itself that men have failed to recognize its dignity and importance; have been content with this one-sided training and have given the first place in their minds and attention to one of the subdivisions of a business rather than to the business as a whole. No man can be a good general manager because he is an exceptionally good financier, salesman, or producer. If he gains eminence it will be in spite of this fact. It is the ability to surround oneself with able men in the different lines; to give directions as to what is desired in such a manner as properly to supplement the information at present possessed by the subordinates; to determine proper standards for performance; to secure proper records of achievements and to judge departmental results broadly and equitably from a comparison of these that insures success.

The field of application of the science of administration, or the direct control of mental force, and through it of physical force, lies, therefore, in the direction of the business as a whole, and it must be so applied in order to secure the best results. If, then, we are dealing with a very real, if somewhat intangible, force and one which is amenable to much the same formulae as are other forces with which we deal more complacently, though we know but little more about them, may it not be possible that men who have made a long study of this subject are better able to devise effective means for the utilization of this force than those who have not approached the subject from this point of view? Is it not even more important that the control of this mighty force, over and above all lesser forces, should be intrusted to those men who have demonstrated, when dealing with other matters, their right to the title of engineer, who has been defined as one who "controls the forces of nature for the use and convenience of man?"

[Reprinted from the Iron Age, Mar. 23, 1911.]

[NOTE.—A series of three articles. The first appeared in the Iron Age of Jan. 26, 1911, p. 248; the second in the Iron Age of Mar. 16, p. 662.]

The old proverb says: "'First catch your hare; then cook it." So, in considering the application of the science of administration to business, we must first select the business itself. This will depend upon various things—the personal tastes, experience, and abilities of the individual, the location, the conditions of supply and demand, etc. The individual will find, as at all future stages of the proceedings, that while he can and should get the advice of many, he can not delegate the responsibility of digesting and applying the advice. Having carefully considered various lines of business in the light of the above, and having settled upon some line as the most suitable one for him under the circumstances, the prospective business man will find that this one decision, together with the circumstances in connection with it and him, has practically established a foundation from which all future action must be developed and with which it must be in harmony.

Assuming that the intention is to manufacture, a unit of the product must be minutely separated into its prime or indivisible factors as to material, form, and process. This reveals the physical operations which are necessary for its production, and the operations determine the apparatus which must be employed to perform them, each successive step being a logical development from that preceding it.

THE PRODUCTION OF FORCE.

At this point we are confronted with the problem of producing the force by which this apparatus is energized, and, as has been seen in the foregoing article, it is of two principal types—physical, which may be either of mechanical or animal origin, and mental.

The physical force must be determined, both as to character and quality, and traced back to its origin, which may be in coal or other fuel, in the rushing stream, in the wind, or in an animal, and the necessary apparatus for transmitting, controlling, and generating it must then be determined. Each unit of mechanical force and of animal force, except that of human origin, requires human physical force to control it and human mental force to direct it; so that we must not only determine the quantities of these, but trace the mental force back to its point of origin in the minds of the owners of the business and determine the necessary means for its transmission, control, and generation.

RELATION OF DEPARTMENTS.

It is at this time that we discover the relations which exist between the producing, selling, financing, and other divisions of a business and their natural and logical sequence, this sequence being one of chronology rather than of intrinsic importance. It is only when these relations and sequences are properly adjusted that the ultimate measure of success can be achieved. Because the possibilities resulting from such an adjustment are realized or even imagbut with their small numbers and low efficiency. As the case usually presents One hears much complaint regarding the burden imposed by the large number of so-called "nonproducers." The real trouble is not with their large numbers, but with their small numbers and low efficiency. As the case usually presents itself, most of the administrators are simply "human telephones," who merely transmit descriptions of desired results. The formulation of the methods by which these results are to be obtained is largely in the hands of the actual workers or their immediate supervisors. This is all wrong. A number of comparatively poorly trained workers ably directed will be more efficient than an equal number of skilled workers poorly directed. If, then, in any concrete instance, we consider the training of the workers as a fixed quantity for the time being, it is obvious that, in order to bring about the most immediate improvement, the primary effort in that direction should be exerted by the directors or administrators of the enterprise.

OWNERS AND MANAGERS.

At this point consideration must be given to the dual character, seldom realized to the fullest extent, of organizations. First, we have the owning element, which may be either one or more individuals. This element possesses and exercises the right of decision as to what things are to be done. Second, we have the operating element, always composed of many individuals of varying degrees of authority and responsibility, which does or should possess and exercise the right to decide how things are to be done.

The science of administration is manifestly applicable almost solely to the second element; and the point of application should, therefore, be at its head, which is also the point of contact with the first element. This point of contact is usually personified by the individual acting as president and general manager. He is the "dividend maker" for the business, and is, therefore, presumably open to every influence which will legitimately increase their volume. But because, as has been said in the last article, the general manager is frequently without broad administrative training, but has attained his position through marked ability in one of the divisions of a business, he is so bound up in such division that he sacrifices, or at least is indifferent to, the interest of the other divisions. Hence, when the dividends become impaired, the first element often finds itself obliged to decide that one of the things to be done is the application to the business of the services of a specialist, in order to determine what must be done to restore the destroyed balance between the divisions. This condition is always to be deplored, because the man who should eagerly receive, assimilate, and act upon the advice so tendered, makes its reception needlessly difficult. When, however, the application is made at a point much further down the line, or when the specialist is unable to cover the entire field, an infinitely worse condition is created. This is the reason why many specialists in betterment lines, where work is excellent so far as it goes, are unable to produce as great or as lasting benefit as they and their clients desire. The different phases of a business are so interwoven that it is almost impossible to improve one division without coming in contact with the others. Because it is far more difficult to coordinate the work of several specialists than to do the work of any of them, such coordination is generally far beyond the client's ability, and therefore, what should be sought is the advice of an aggregation of specialists, coordinated under a competent head.

PLANNING OF ORGANIZATIONS.

In the design of a building the engineer begins with the arrangement of the features for which it is necessary to make provision in the first story of the structure. Subsequently he determines the necessity for and arrangements of succeeding stories until all the accommodations required have been planned for. The engineer then retraces his path, working downward from the roof to the foundations because the supports in each story must carry the accumulated weight of the part of the building which lies above, and designs the structural work accordingly. He then goes over the work a third time, and actually constructs the building from the ground up.

In like manner an organization must be studied: First, the workers necessary for the operation; second, the various grades of supervisors and directors, gradually decreasing in number with increase in rank, until the apex is reached. Means for the formulation and transmission of directions (not merely the telephoning of orders) as to performance, including the necessary standards from the chief administrative officer down to the lowest employee, must then be devised. The next step is the provision of means for the collection and transmission of accurate records of actual performances, from the lowest worker to the chief executive, in such a manner as to correspond exactly with the standards accompanying the directions. This will facilitate the making of the comparisons which are essential to the efficient conduct of the business.

STANDARDS AND RECORDS.

From this analysis we perceive a curious thing which has taken place in the development of most lines of business—namely, that cost and other records were developed before standards. Their development, therefore, has been largely empirical rather than logical. Hence many elaborate systems have failed to produce satisfactory results. This trend of effort, moreover, has had the effect of causing business men to endeavor to get the information from one element which can only be obtained from a comparison of two elements. It has also blinded their eyes to the omission of the determination of standards from its proper place in the sequence, which is before the records.

In this connection another circumstance, previously alluded to, is of interest. The employer, being pushed further and further away from the worker by the size of the business, has decreased in the ability to give clear directions as to the desired performances without making provision for the supplementing of his ability in this respect. His directions, acquired by experience, having been given orally, he does not realize that they are no longer given. Because he has generally recruited his administrative assistants from the clerical ranks these directions are less and less frequently supplied, and the workers are forced more and more to depend on their own initiative. The result is to-day that the majority of information as to proper methods is possessed by the workers rather than by the administrators or executives. This information is at present largely in the nature of transmitted legend and grows more and more vague with each generation. Unless scientific men are not only allowed but urged to take up the study of the productive methods for the operation of human minds and hands, as well as the operations of machinery, we shall surely and certainly come to a standstill. We know very little to-day about the possibilities of human physical effort and next to nothing about mental effort.

WORK OF THE SPECIALIST.

When the business man, therefore, decides to avail himself of the services of an association of specialists in the development of his business he should give them his full confidence and cooperation. This should be warranted by his previous investigation of their standing. Every facility should then be afforded for a thorough examination of the business as a whole. They should first make an exact statement by text and charts of the conditions encountered. From this should be evolved a comprehensive plan of the remodeled organization and its methods of operation. This should be earnestly studied by the client in conjunction with the advisor.

When the plan has been perfected and the client is thoroughly conversant and in harmony therewith, the work of installation may begin. It will generally be found that the administrators and supervisors are far too few to handle the work properly,. No new man should be brought in from the outside if any

present employee can be developed to fit the demands. It is not necessary to wait for the full development of the subject matter of the directions and records before filling up the gaps in and realigning the organization, providing the proper lines of transmission have been worked out. Direct improvement in a considerable measure can be secured from a correctly apportioned organization, even if some of the members are rather new to their duties. It is manifest that in an electric installation all the units of apparatus must be in place before the current can be made effective in any degree. The service, however, can be greatly improved by careful adjustment as time goes on. Hence, the full complement of organization, by being enabled to give greater attention to the methods then in use, can secure better results from the start.

Standards are the basis of directions. These must next be determined by the client's employees delegated for the purpose and acting under the guidance and instruction of the specialists. Standards for human performance must be based on the amount of force a normal man can generate without loss of elasticity under proper conditions. As these are determined it will gradually become possible to comprehend the conditions which do or should exist, and hence to issue more adequate directions.

The next step is to revise the conditions so as to make it possible for the workers to comply with the standards. Every stumbling block in their pathway must be removed if they are to achieve the anticipated results. Simultaneously the records must be so developed as to correspond accurately with the standards and directions in every detail. There must be both a record and a standard for every operation performed. The comparison between these two is of the most vital importance and can not be overestimated.

STIMULATION FOR ADMINISTRATORS.

When a proper organization and conditions have been created, together with safe and sane standards for desired performances and accurate records of actual achievements in every department, it is possible to stimulate and encourage the workers to come up to the standards by making their compensation dependent in part upon their effort and commensurate with its amount. In considering this phase of the subject too much stress can not be laid on the importance of applying this principle to the administrators and supervisors as well as to the manual workers. One of these individuals, since he controls many workers, is responsible for a larger amount of concrete results than any one of them; therefore his compensation should be determined on a corresponding basis.

The usual supervisor or administrator is too often a human telephone, and is of correspondingly little value. The trained supervisor or administrator must be developed by his employer, in view of the shortcomings of our educational system in this respect, and is correspondingly valuable. This principle is applicable to the entire operating organization, from errand boy up to general manager.

After these methods have been installed and placed in operation much thought should be given to their maintenance and continued improvement. The records should be continually searched for indications as to the possibility of improvement. Suggestions from the operating organization should be referred to the standardizers who can work them out to the best advantage, and should do so as a part of their routine work. The makers of the suggestions should, of course, be adequately rewarded.

WHAT SPECIALISTS' STUDY DISCLOSES.

The specialist, as has been said, should be an association of specialists, rather than an individual. It is to the client's interest to place the matter in the hands of such an organization from the start. This will result in his being supplied with the proper men whom he needs as permanent advisers, and in placing him in a position to secure from time to time harmonious advice in other lines where only occasional assistance is required.

No specialist, whether permanently or temporarily a part of the organization, should ever give an order or direction. The exercise of this power should be confined strictly to the members of the operating organization. The function of the specialist in administration is to intensify the mind of the administrator by his advice just as the gas flame is intensified by the oxygen introduced by the blowpipe.

The specialist should make close observations of operations, deduce his conclusions and communicate them to the administrator of the proper grade, but it is only as he can inject his mental force into the mental force of the administrator that he can attain success. He should only discuss the work on the spot as a last resort, and when the mind of the administrator is such that an ocular demonstration is essential to his receipt of the suggestion. A study of the usual administrative methods from the scientific standpoint discloses:

(*a*) The terrific load of petty detail carried by men whose time is too valuable to devote to such things.

(*b*) The inability of administrators to work at arms' length through the mediums of standards and records and their infatuation for close contact and its consequent loss of perspective.

(*c*) The widespread failure to use well-known, effort-saving devices—telephone, telautograph, pneumatic tube, etc.

(*d*) The lack of realization of the necessity of using the cheapest man for the job in administration as well as manual work and, coincidently, that the best is always the cheapest.

(*e*) The lack of realization that the coal, boilers, engine, and generator must be adequate to the task or the lamps will not burn or the motors move.

(*f*) The lack of realization that the advice of specialists is absolutely essential in order to create a proper organization.

(*g*) The lack of realization that the chief executives, must devote their personal time and effort to the study of the advice of the specialist and to its application.

(*h*) The lack of realization that administration, or the operation of this human machine, is a science in itself.

THE INSTABILITY OF MONEY.

[By H. F. Stimpson, chief engineer, Universal Audit Co., Singer Building, New York.]

We are accustomed to think of money as one of the stable thinks of life. The gold and silver pieces look much the same from year to year. Recently we have heard much discussion of "the purchasing power of the dollar," and this causes some of us to think that perhaps money is not quite as stable as it has seemed to us in the past. Let us, therefore, consider the functions which money performs and the basis upon which our money or that of any other people really rests.

Money has been glibly defined as "a medium of exchange." Exchange of what? The commodities used for food, clothing, shelter, or amusement? Not at all. That is the view of the savage, but it should not be that of the civilized man.

A commodity is raw material to which energy has been applied in such a manner and with such a result as to fit it for the use and convenience of man. Take, for example, oak wood. Consider the values, per unit of bulk or weight, of the rough lumber; of plain, substantial furniture; and of richly-carved furniture. As the oak grew without the aid of man, the real values to man have been added to the material by the energy generated or directed by man. Hence, the real exchange is that of the energy generated or directed by one individual in producing a commodity for that of another individual producing another commodity. The exchange, then, can only be equitable when the energy which has been applied to one commodity equals that which has been applied to the other. Also, if the statement as to the amount of energy which has been applied to material in the production of a given commodity, in terms of money, is inaccurate, the exchange is likely to be inaccurate and therefore inequitable.

Under present conditions we cause the Government to control and guarantee the amount and quality of the gold in one of the dollars which are the basis of our monetary system. Why should we not cause the Government to control or guarantee either the relation between the gold dollar, or its representative in bills, and a definite quality or quantity of energy, or, to speak more correctly, the quantity and quality of energy expended in the production of any commodity? Upon this, as we have seen, the true value of the commodity depends and it would seem to be even more important that the purchaser should be

assured of this than that he should be assured of the character of the medium with which he purchases it.

It has been contended by many able minds that price is the expression of the law of supply and demand. If the true relation between the cost of production, or energy absorbed, and the selling price was always known, then this might be true. As a matter of fact, neither the producer (or seller) or the buyer know this relation with any accuracy, and the buyer the least of the two.

The reasons for this are threefold:

First. The present average cost of production or operation is much higher than it need be. This has been repeatedly demonstrated by efficiency engineers. The cause of this, to the extent of at least 75 per cent, lies in the insufficient training and management of administration organization, which are generally but one-third as large as they ought to be to develop the full capacity of the workers. As the administrative section is very much smaller than the section embracing the direct workers this is plainly a source of loss to the business as a whole.

In one instance, by proper instruction alone and without any material changes in plant or equipment it was made possible for one man to do the work for which three had previously been employed. In another case, due specifically to incomplete and undeveloped organization, four men are employed where only one is really necessary. These are fairly representative cases. The wages of the extra men are actually paid, in the long run, by those purchasing the necessaries of life and who, as a rule, can least afford to bear the extra burden.

Second. The accounting of the cost of production, as generally practiced, is far from accurate; especially as to the processes by which the original raw material, as a growing tree or ore in the ground, is first transformed into a commodity. Thus an element of error is introduced which grows rapidly with every successive transformative process.

Third. There is a deliberate unnecessary and short-sighted inflation of price all down the line. This is as true of the transactions involving the sale of labor as of commodities. In many cases the worker has failed to realize that the increase in wages which seems so advantageous at the moment speedily reacts upon other workers in such a manner that they demand increases for themselves. These, sooner or later, are sure to destroy the original temporary advantage. This theory of increased prices and "passing it along" has been found not only to be of but temporary advantage to a few but to be absolutely harmful to society as a whole, in the long run.

The price of the transformation of raw material into a commodity, therefore, is largely affected: First, by ignorance of the results which it is possible to attain; second, by ignorance as to the facts respecting the processes as actually carried on; and third, by a deliberate padding of the so-called costs at each successive sale.

These factors have nothing to do with the law of supply and demand. In many instances they are under the control of persons who have no immediate connection with the process of the sale of the finished commodity. Yet these persons usually have it in their power to effect large and arbitrary increases in the cost of the finished product which certainly affect its selling price eventually. There is now no definite relation between terms of energy and terms of money. Yet the price, in terms of money, is all the guide which the purchaser has to enable him to determine whether the energy by whose exertion he has acquired his money is, to any extent, equal to the energy which has been expended in the creation of the commodity which he is purchasing.

Hence, the importance of knowing that the gold dollar or its representative is standard as to quality or quantity sinks into insignificance when contrasted with the question of quality and quantity of that which is exchanged by its means. The vital question, then, is whether the dollar for which a man is paid for his energy will purchase for him an equal quantity of the energy of others. This is the true measure of the value of money, and beside it the intrinsic characteristics of the unit of money are quite unimportant.

Let us see what the Government does in the act of coining. It establishes two characteristics of the unit of money—quantity and quality. The unit of money must contain a certain volume of gold, and it must be of a certain degree of purity. The establishment of these facts is of importance to all. No one wishes to give more gold for a commodity than is necessary or to receive less. If then, as we have seen, the value of commodities lies in the quality and quantity of the energy which has been applied to the raw material from which the commodity has been produced, why should we not cause the Government to

certify to these facts? When shall we comprehend that the individual who hopes to gain by inflating the price of the energy which he sells will surely and certainly find himself, to his sorrow, overbalanced by similar acts on the part of the individuals whose energy he buys? It is only in the country of the blind that the one-eyed is king.

On the other hand, the average purchasing or energy-generating power of the individual being fixed, if the common tendency is to eliminate waste and overcharge, the individual will just as surely find that his unselfish efforts in behalf of the community will be as surely and certainly overbalanced to his joy by the acts of those about him. The golden rule, that it is well to do to others as you would have them do to you, is not a mere empty sentimentalism, but the accurate expression of a fundamental law.

THE ECONOMICS OF "EFFICIENCY."

[By H. F. Stimpson, chief engineer, Universal Audit Co., Singer Building, New York.]

The articles on efficiency which have appeared, especially since the decision on freight rates of the Interstate Commerce Commission, have merely skimmed the surface of things and have failed to consider the economic questions which are at the bottom of the whole matter. Therefore, the angle from which the subject is considered in this article may be of interest.

Most men will admit that we have been experiencing a continuous increase in costs in every phase of life for a considerable time. It is not the arbitrary amount of either income or outgo, but the relation between the two which determines wealth or poverty. Hence the increase in prices received has been seen to be fruitless if followed by an equal or larger increase in the prices paid.

It was only a question of time when this vicious cycle of increase had to stop. It was not a matter of accident that the brakes were applied to the railroads. It was for the reason, perhaps more instinctive than logical, that freight rates, which enter many times in the cost of production, are, with one very important exception, the last factor in the determination of cost to the consumer. That exception is the cost of retail distribution and its accompanying profits. This is the point where the brake should have been applied consistently with the line of procedure which has actually been initiated. That this line of procedure is perhaps unwise may be shown later.

Every argument which has been advanced in support of a demand for greater economy and efficiency on the part of the railroads is applicable to the retailer on the one hand and to every link in the chain down to the lowest grade of manual workers on the other side. Because the manual worker usually labors under disadvantageous conditions which it is exceedingly difficult for him to change, at least directly, he should be regarded with much leniency. As, however, he constitutes numerically a large proportion of the people as a whole who actually determine the conditions under which we live, he must assume his corresponding share of responsibility.

The root of the present difficulty is in the possession of a mistaken idea, by every man in the line, that the way to increase wealth is to get more rather than to give more. The original trading capital of every man is his natural force or power, which is of two kinds—mental and physical. The possession of the former is what differentiates man from an animal. The ratio between the two forms is the true measurement of his civilized development. It is by means of his mental force that he directs and controls his physical force and that of animals and machines. The true wealth of a nation, then, is in its brains and not in its muscles or its dollars. The two latter are useless without the former. The muscular idiot is a liability rather than an asset.

The commodities which constitute both the necessaries and the luxuries of life consist of material to which physical force, directed by mental force, has been so applied as to fit it for the use of man. Consequently their real value to man must lie in the amount of mental force so applied. As our means of measuring both the generation and expenditure of this force are as yet crude, we have to measure it largely by the amount of physical force which our mental force directs. The amount of physical force which an individual can command, whether generated by himself, his animals, or his machinery, is the working index of his wealth. This applies to associations of individuals and even to nations. I repeat, therefore, that the true value of a commodity is in the

amount of mental force which has been applied to it. This is indicated by the amount of physical force so applied.

Money, in various forms, has long been used as a "medium of exchange," but because we have failed to realize that force and not substance was its real basis of value, the logic of our prices has become seriously deranged. Mr. F. W. Taylor has recently described the methods whereby a laborer was enabled, by scientific management, to increase the amount of pig iron handled from approximately 12 tons per day to 48 tons per day. His wages were increased from $1.15 per day to $1.85 per day, or 60 per cent. Note the relation between money and work at either of these stages. If $1.15 was a correct wage for the exertion of the force, in foot-pounds, necessary to handle 12 tons, then when the force was increased fourfold the worker should have been paid $4.60. If, however, $1.85 was the correct wage for the exertion of the force necessary to handle 48 tons, then the man should have received only 46 cents for handling 12 tons.

I suggested over a year ago that our medium of exchange should be based directly on units of force. If this were the case, we would have to determine and combine the forces expended in the operation itself and in the production of the necessary material and equipment. Our present method of handling this problem is to determine and combine the expenditures of money, which have often no accurate relation to the expenditures of force for which they stand. Hence our impressions are delusive. In the first place, the correct determination of costs, even in terms of money, is by no manner of means a common occurrence. In the second place, there is no kind of common or logical ratio between the amount of money paid and the amount of force expended. With human labor at 15 cents per hour and electromotive power at 2 cents per kilowatt hour the human power costs about 85 times as much as the electric. What is needed, therefore, is—

1. A determination of the amount of energy which can be generated by the stomach and heart of an average man, and which constitute his boiler and engine.
2. A unit for expressing this determination.
3. Methods for applying this unit in the process of measurement of individual capacities.
4. Methods for measuring the expenditure of heart power under different conditions, such as (*a*) walking unloaded, (*b*) carrying a burden, (*c*) pushing a truck, (*d*) turning a winch, etc.
5. The capacity of the human body when acting as a storage battery or accumulator.
6. The determination of the true ratio of costs between human, animal, and mechanical force, taking the human physical power as the basis. It is of course recognized that there are many different varieties of animals and machines.

When these things have been ascertained we shall have gone a long way toward determining the true cost of any article.

Into each factor of production (material, equipment, and labor) enters the overhead charge. The most difficult element of this is the supervisory or administrative. Our adjustment of mental force to the physical force which it directs, or the mental force which it controls, is about the most haphazard thing in the world. If we reason backward we can determine how much physical force is directed by any one mind. Also, in succession, by a process of combination, the amount of physical force controlled by any one mind acting through the minds of others. But we are as yet unable to predict how much physical force one mind can direct. Hence we are unable to adjust the division of mental work or the assignment of mental workers with even the low degree of accuracy which we have attained in the disposition of physical force.

A crying need of our civilization at this date is deliberate experimentation along this line by well-equipped specialists having this definite object before them. Most of the large organizations with which I am acquainted have far too few mental workers. The inevitable result is a great uncertainty and extravagance in the utilization of physical force.

The antagonistic attitude which organized labor has generally assumed toward labor-saving methods and appliances does not proceed from unworthy motives, but simply from a misconception of facts. The supposedly better-informed persons, their employers, with whom they naturally come in contact, are but little in advance of them in this respect, hence the opportunity for improvement on the part of the employee has been small.

A unit of human physical force can produce and control a large number of units of mechanical force; hence, the human physical force is more valuable than the mechanical force. In like manner mental force, each unit of which controls a far greater number of units of physical force, is more valuable than human physical force. The reason the civilized man has more comforts than the savage is because he first exchanges his valuable physical force for the cheaper mechanical force and, secondly, his valuable mental force for the cheaper physical force, and thus makes a profit on each transaction. The savage pays for the physical force he requires with physical force of exactly the same value, and so makes but little if any profit. The section man applies his physical force directly to the operation of the tool and gets a low wage. The locomotive engineer applies his physical force to the control of the far greater mechanical force which operates the tool and, consequently, gets a higher wage. The superintendent depends but little on physical force, but his mental force controls the mental forces of many engineers, and so gets a higher rate of wages. So it goes up the ladder. As long, therefore, as a man insists on depending for his existence on the development and sale of the lowest grade of force which he can produce, just so long will he remain poor.

It is only when he exerts himself to take advantage of such educational facilities as may be within his reach, and thereby becomes enabled to produce a higher grade of force than formerly, that he can possibly become rich. He can legislate on the subject of wages till the crack of doom, but his purchasing power is unalterably fixed by the quantity and quality, first, of physical and, second, of mental force which he can generate and sell. From 1889 to 1899 I was in charge of the free evening drawing school in an eastern city. The pupils ranged in age from about 18 to 45 years, most of them being ambitious mechanics. Such of these men as completed the course bore testimony to the fact that it was directly and financially beneficial to them. Most of these men were metal workers, but the total enrollment was an exceedingly small per cent of the workers in that locality. I urged a number of men in other trades to attend the school. They replied that it was easier to increase their wages through the medium of the union. When, however, the increase in the subsequent price of commodities took place, and which was caused by a process, applied to labor, which was exactly similar to that known as "stock watering," the advantage of their forced increase vanished. This is the inevitable result when natural values are artificially inflated.

Because organized labor has never fully realized these facts, it has always persisted in clinging to what we now see is a state of only partial development. The common welfare, as well as its own, requires that it should proceed further. They who stand still really go backward.

The reason why this truth is not more generally realized is in our defective methods for conducting the process of exchange. The real exchange is that of force for force, not that of force (or labor) for money, or of money for commodities. There is not half as much trouble with our banking system as is generally supposed. The solitary man cuts wood for his fire, hunts game for food, dresses skins for clothes. When he secures associates they specialize and exchange the fruits of their labor, each one still remaining a producer. Finally comes one who offers to effect the operation of exchange for a toll from each commodity handled. The others being busy, he takes advantage of their preoccupation and gradually increases his toll from an amount which corresponds to the force which he has exerted and which is the measure of his service, to a greater amount. So long as he has to take his toll in commodities there is small temptation to increase it because of the depreciation by decay or theft, the inconvenience of storing the bulk, and because its existence is a visible monument to his greed.

The invention of money and the illogical relation which has always existed between money and the force which it represents in the process of exchange have afforded splendid facilities for the concealment of this excessive toll, and the imposition of accompanying abuses upon the community.

Hence the most vital questions before the human race to-day are these:

1. The determination of proper methods of measuring physical and mental force.
2. The establishment of a correct relation between units of force and our medium of exchange.
3. The standardization of the amount of force which should be expended for each given operation.
4. The establishment of correct cost keeping in correct units.

5. The limitation of tolls which may be exacted for the performance of commercial service to amounts which shall accurately correspond with the power expended. This is the true measure of the service rendered.

The man of large ability in the generation and the utilization of force should be rewarded in proportion to his efforts. The man who profits at the unjust expense of others and by concealment of the real facts should be prevented from committing further depredations.

Early in this article I questioned the wisdom of the line of procedure which has been adopted. The real issue is not between capital and labor, but between buyer and seller. The problem is that of devising an equitable and fair method of conducting the process of exchange. I have heard of a case where a seller of automobiles charged $100 for tops which cost him but $35. This was an unjust toll, yet no more so than where a mechanic, office assistant, or domestic worker endeavors to reduce the amount of service rendered, i. e., force generated and applied, below a reasonable amount. At present this amount is a matter of guesswork on both sides. It should be so no longer. Correct standards hurt no honest person. The purchase of human physical or mental power at a definite rate per unit would be mutally beneficial by preventing mutual injustice. This article has defined the problem. Who will solve it?

LB Mr '12